Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY
WOOLWORTH BUILDING, NEW YORK.
CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico..... $5.00
Canada 6.00
Foreign Countries (excepting daily editions)..... 8.00
Single Copies .....15 cents each

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention daily issues, North America, $1; foreign, $2.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE that of this issue (the monthly Engineering & Maintenance Edition) 10,700 copies were printed; that of these 10,700 copies 7,384 were mailed to regular paid subscribers to the weekly edition, 1,863 to subscribers who get the Engineering & Maintenance Edition only, 166 were provided for counter and news companies' sales, 977 were mailed to advertisers, exchanges and correspondents, and 310 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 351,150, an average of 9,241 copies a week.

THE RAILWAY AGE GAZETTE and all other Simmons-Boardman publications are members of the Audit Bureau of Circulations.

VOLUME 59 SEPTEMBER 17, 1915 No. 12

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*Illustrated.

Passengers Killed in August

The train accident record for August, printed in this issue, contains one collision and one derailment which together are charged with the deaths of seven passengers, a record more fatal in this respect than has been published before for ten months. Not since September, 1914, has there been a collision or derailment killing as many as four passengers. The accidents now reported, Orient, Ohio, and McCorkle, W. Va., are both typical, in that they were occasioned by well-known dangers, the prevention of which is so costly that on most railroads it is deemed necessary to accept the risk. At McCorkle, according to the inspector for the State of West Virginia, a guard rail would have prevented the fatal consequences; but the question with the railroad engineer is how to protect the right places. Guard rails would add to safety in a thousand places; which of these shall be dealt with first? We have not enough facts to judge of this particular case; but the main general fact is constantly with us: where shall the available money be spent? What road has installed guard rails (and other precautionary fixtures) at every place where they might sometime be useful? At Orient the risk was in suspending the block system, to save time. Every road, everywhere, deems it necessary, under some circumstances, to trust to enginemen to follow preceding trains according to their own judgment, not imposing an absolute space interval. In automatic block signaling this is done everywhere, almost every day. Where and when should this laxity be forbidden? In city subways, equipped with automatic stops, it is forbidden at practically all times. Where extra passenger trains are running at night, and where there are unusual and troublesome causes of delay (as at Orient) there would seem to be good reason for always imposing the absolute space interval, even though this should necessitate blocks ten miles long, or longer. But, again, who shall have authority to direct the imposition of this requirement? It may have to be done at a half hour's notice. Such a general rule would imply the employment of very high grade men for train despatchers—or of superintendents who should be on duty night and day.

"Sloppy, Vicious and Abusive Whistling"

Many years ago the railroads adopted a code of locomotive whistle signals which soon became standard on all lines. The same number and length of blases mean the same thing on every line. The whistle is expected to be used reasonably and for business purposes only; no screeching or playing with the whistle is very common; the code can scarcely be recognized. The road-crossing signal is most abused; what we usually hear is two long, one short and then one very long blast, with varying degrees of emphasis and screeches on the last blast. The call for the proceed signal at a railroad crossing (four moderately long blasts) is also greatly abused in four unreasonably long and loud blasts. We all know this from experience. We have all often "heard 'em blow" for a crossing at 4 o'clock in the morning. The whistle is a necessary device, but it should not be abused; all playful, slouchy, sloppy, vicious and abusive whistling should cease. The foregoing is an editorial, slightly condensed, from the Alton (Ill.) Evening Telegraph. It is printed here without quotation marks because it has an application in hundreds of places, and in at least 47 states; and we wish to adopt the words of the Evening Telegraph as our own. Why do not appeals like this have more visible effect? As railroad officers have been trying for half a century to abate the whistle nuisance, and yet in a multitude of instances have failed, there will be no unfairness in turning elsewhere for relief. Why not try the unpractical proposal of a New York magazine editor, to make an appeal to the locomotive engineers? Is not the engineers' brotherhood a public-spirited body, thoroughly devoted to the interests of the people? We have called this proposal unpractical, but no engineer can claim that it is unreasonable. We say unpractical because we have never discovered any way

to elicit the public spirit of the members of the brotherhood; but their leaders, when appealing for sympathy in case of a strike or threatened strike, seem always to be willing to be as fair with the public as they expect the public to be with them. And here is a chance to show good will. There is no question but that the public feels aggrieved at the whistle nuisance. The locomotive engineers of the United States have been called the highest class of "labor"; men of character and intelligence; members of the most enlightened labor brotherhood. It must be that a fair percentage of them have in their souls enough music to know slovenly whistling when they hear it, and enough influence, courage and regard for invalids, and critics' feelings to stir up their brethren. In asking the best enginemen in this manner to lend a hand in reforming some of the second best we may seem to be ignoring the superintendent and the trainmaster; but nobody will object if the enginemen get the start and attack this nuisance first. As long as the present condition continues, the feeling of the public, in the towns along the lines of the great majority of the big railroads of the country—a feeling that does not find very frequent expression, but which, nevertheless, is deep-seated—is that both the officers and the enginemen are very deficient in those fine qualities of mind which are characteristic of men who do their tasks skilfully and who have a reasonable amount of consideration for the "other fellow."

THE GALVESTON CAUSEWAY FAILURE

THE storm which struck Galveston and vicinity on August 16 and 17 has attracted a great deal of attention from railway men, primarily because of the destruction of a part of the Causeway, completed in 1912. The importance of this structure lies in the fact that Galveston is located on an island and this Causeway provides the only avenue for rail communication with the mainland. Since the storm various methods of repairing the structure and of preventing a recurrence of its destruction have been suggested, but all of these appear to overlook one of the main reasons for its failure.

After several days of southeast winds such as preceded the recent storm, there is a marked increase in the water level in the gulf and also in the inland waters of West bay and Galveston bay. All adjustment of water levels is necessarily obtained by the ebb and flow of water through the Galveston jetty or via the San Luis inlet and West bay. The discharge of water through these inlets is a matter of common knowledge and strong currents have been observed even during moderate disturbances. Previous to 1900 three timber railroad trestles and a highway bridge over West bay connected Galveston with the mainland, but all these were destroyed by the storm of that year. Following this, only one trestle was rebuilt. Stimulated by a demand for a permanent structure which would afford connection with the mainland at all times, the well-known Galveston causeway was built jointly by the city, the county and the railroads at a cost of $1,750,000 and opened in 1912.

In this structure the channel width of 10,680 ft. offered by the pile trestle was reduced to 2,437 ft. of concrete arch viaduct, the remainder of the crossing being constructed of sand fills restrained between two lines of concrete sheet piling and concrete blankets on the slopes. The grade of the new structure as established brought the crown of arches at least 2 ft. below the level of high water of 1900. Thus the waterway was cut down over 75 per cent. In the recent storm, water overtopped the embankments and washed out the sand, allowing the concrete blankets to fall in. In this way practically all of the Virginia Point approach embankment was destroyed and all but 2,300 ft. of the Galveston end went out, while the concrete structure was uninjured. Various suggestions have been made to the effect that the embankment would have stood if it had been made of heavy rip-rap instead of sand, or if the concrete blanket had extended over the entire surface. It would appear, however, that owing to the restriction of the waterway, the embankments must have been subject to considerable static head in addition to the wave action. It is said that the water level was 2 ft. higher than in 1900. Therefore, even if the embankment had been made impregnable to wave action, it is not certain that it would have long withstood the pressure of the water as a dam, for the concrete sheet piling extended only 14 ft. below low water and rested in the sand without entering the clay found at a lower level.

Now that a considerable portion of the causeway approaches must be rebuilt, it would seem that more attention should be given to the provision of ample waterway. The construction of additional arches is doubtless the most practical solution and even a raise of grade of the entire structure appears desirable.

CAR SURPLUSES AND SHORTAGES

AN encouraging indication of reviving business prosperity, as measured by the growth in volume of railway traffic, is afforded in the latest report of the American Railway Association, just issued, showing a reduction of 76,000 in the number of surplus freight cars during the month of August. The total surplus on September 1 was only 189,919, as compared with 266,312 on August 1. The surplus on September 1 of this year was, however, still 24,000 greater than that on September 1, 1914, when the surplus was 165,244.

The increasing demand for freight cars is, of course, due primarily to the beginning of the crop movement, which, according to the latest report of the Department of Agriculture, is likely to exceed slightly the high-water mark of 1912. In 1912 similar predictions of bumper crops were usually accompanied by warnings of a car shortage. This year talk of a car shortage would seem as music to the ears not only of railway officers but of most business men also. All of which serves to call attention to the fact that for a long time the car-shortage problem has been somewhat like the snakes in Ireland.

The last period in which there was a car shortage was the month of October, 1913, when shortages in various parts of the country exceeded the surpluses in other parts by from 2,000 to 6,000 cars. It is necessary to go back three years, to the fall of 1912, to find a net shortage serious enough to constitute a problem either for the railways or the shippers.

The popular notion is that the railways are constantly being confronted by the problem of getting cars to move their traffic. The facts show that for some years their problem has been to get traffic to move in their cars. The statistics compiled by the American Railway Association demonstrate that car surpluses have been much more chronic and general than car shortages ever since there were such loud complaints about car shortages some years ago. The car shortages have always been but small, brief and local in their effect, while the car surpluses have been large, protracted and general.

The American Railway Association began to compile and publish statistics of car surpluses and shortages on January 2, 1907. It continued to make such reports fortnightly until November 1, 1914, when they were temporarily discontinued. Since February 1, of this year, the reports have been made monthly. During the period from January 2, 1907, to October 1, 1914, in only 25 of the fortnightly statements did the shortages exceed the surpluses, while in 175 the surpluses exceed the shortages. It is a matter of common knowledge that during the time when no statistics were compiled business was greatly depressed, and that there were large net surpluses, and since February 1, this year, the monthly reports have shown consecutive surpluses varying from 189,000 to 327,000. Back in 1906 and 1907 the railways were denounced from coast to coast for not providing enough facilities to handle their business. Yet in the 8 years and 8 months since the first statistics of surpluses were compiled we have had net shortages of cars only about 10 per cent of the time, while during 90 per cent of the time there have been from a few thousand to nearly a half million cars for which there was no business, but which were

costing their owners large sums in interest on the idle investment as well as for maintenance.

The car shortage "bugaboo," as it has since turned out to be to a large extent, came into prominence in the fall of 1906, when a very rapid expansion of business of all kinds culminating at the time of the heavy demand for cars for crop-moving, found the facilities of the railways seriously inadequate. There was, therefore, widespread agitation, and much ill-advised legislation was passed to penalize the roads for failure to furnish cars promptly on demand. In the fall of 1907 there was another shortage, less serious, which was followed in the spring of 1908 by a surplus which on April 29 reached 413,605 cars. In 1909 and 1912 there were also shortages, but during most of the time, as already shown, there have been large surpluses.

The prevalence of car surpluses during the last eight years has, of course, been due largely to the circumstance that the freight traffic has been growing less rapidly than formerly. It is also largely due to the fact that, when transportation facilities were found to be inadequate in 1906 and 1907, the railways, in anticipation of a continued rapid growth of traffic, began making extensive enlargements and improvements of facilities. From 1898 to 1906 the density of freight traffic—ton miles per mile of road—on the railways of the United States increased 59 per cent, while the investment in road and equipment per mile increased only 3.88 per cent. During the years since that time the situation has been decidedly different. From 1906 to 1914 the investment in road and equipment per mile was increased 20 per cent, while the traffic density increased only 19.8 per cent. When the facilities proved to be temporarily inadequate to the demands of traffic a large number of "reciprocal demurrage" laws were passed to punish the railways for not furnishing cars promptly. If the wise law-makers who passed them would devise some remedy for the true evil, that of an insufficiency of traffic to load the available cars, they would render a real public service.

CO-ORDINATION OF MECHANICAL ASSOCIATIONS

DURING July two mechanical department associations met in convention. The president of one of them went on record as favoring some scheme of co-ordination of such associations, calling attention to F. F. Gaines' remarks on this general subject at the last Master Mechanics' convention. This was President Scott, of the General Foremen's Association, who suggested that the chairman of the executive committee of the various organizations get together with a view of investigating some plan of co-ordination, believing that such a plan would be of benefit to the various organizations in that more and better co-operation would be obtained. The convention of the Tool Foremen's Association afforded an example of the possible advantages of such a plan. This association had long realized that it would be of benefit to the railways if standard reamers could be obtained for frame and rod work. Its members have spent much time in considering the subject and it was very thoroughly discussed at last year's convention. This year the association drew up and recommended definite standards, but under the present system it is difficult to get these standards adopted by the roads. Under a satisfactory plan of co-ordinating the work of the mechanical department associations the recommendations would antomatically go up to those who have the power of fixing standards.

Such a scheme would be of advantage in many respects. It is always a more or less difficult matter for the minor associations to determine upon subjects for consideration at their conventions. The major organizations acting in an advisory capacity and having a familiarity with the entire mechanical department, would be in a position to suggest in many cases the matters which could be most profitably considered.

Such a plan would also bring about much more concerted action among the various associations. It would relieve the major associations of some of their work, eliminate some duplication of work, and give the minor associations more definiteness of purpose. Having thus been recognized by the major organizations it would be easier for the minor associations to obtain a larger and more comprehensive attendance at the conventions. At present there are railroads that do not give the minor associations the recognition they deserve, whereas if they were under the control of the major associations, reporting to them the results of their deliberations at each convention, they would be in a better position to secure support. Several of the roads that send their men to the minor conventions request, on their return, reports of what they gained by their attendance. With a general report to the supervising body, the heads of the mechanical departments would thus be assured as to whether or not it is profitable to have their men attend.

The co-ordination idea is a very good one, and should not be allowed to pass with simply the recommendation of Mr. Gaines. The members of the minor organizations should be made to feel their responsibility, and in no case should these organizations be allowed to lose their individuality. They are in a position to be of material assistance to the railways, as past results have shown. But they do need the co-operation of the higher officers, and only by this co-operation can they be made to be as successful as they should be.

NORFOLK & WESTERN

With a decrease of more than a million and a half dollars in revenues, and with an increase of more than seven hundred thousand dollars in maintenance-of-way expenses due to the fact that the Norfolk & Western has begun to charge depreciation on its principal structures, the company had within a few thousand dollars of as much available for dividends on its common stock in the fiscal year ended June 30, 1915, as in the previous year. The amount in 1915 was $9,490,000, and the 6 per cent annual rate on the common calls for $6,477,000. There was a saving of 11 per cent made in transportation expenses, with a falling off in freight tonnage handled of but 3.63 per cent and an increase of 2.37 per cent in the number of passengers carried.

The distinguishing feature about the Norfolk & Western's annual report for some years has been the liberality of maintenance charges and of expenditures for additions and betterments and the economies which have been effected in transportation expenses. The great point about the Norfolk & Western's economies in transportation expenses is that while the average trainload of freight has increased with remarkable steadiness, the increase in transportation expenses per train mile has not offset this gain, so that the company is actually getting some return from the gain in the more effective use of its plant and its expenditures for betterment of the plant, whereas so many railroads have had the gains from these sources more than eaten up by increased wages or other expenses. Of course the Norfolk & Western has had the same increase in wages as other roads in its territory. Perhaps one explanation is that the expenditures on betterment of the plant have not only been liberal but have been quite extraordinarily free of mistakes in judgment. The steadiness with which the trainload has shown an increase is presumably an indication of the smoothness of the working of the plan of development that makes for stockholders' profits. In 1909 the trainload of revenue freight was 616; in 1910, 635; in 1911, 643; in 1912, 692; in 1913, 764; in 1914, 802, and in 1915, 841. Other roads have shown as great an increase in trainload over this period, but few, if any, have shown gains made so steadily and so uniformly. The credit for such a showing as this must be in part attributable to the foresight and wisdom of the managament and in part to the constant supervision by the operating officers.

The following table shows the ratio of each class of expenses to total operating revenues in 1914 and 1915:

	1915	1914
Maintenance of way and structures	13.35	11.20
Maintenance of equipment	19.40	20.64
Traffic expenses	1.63	1.65
Transportation expenses	29.13	31.50
Miscellaneous expenses	0.25	0.45
General expenses	1.95	2.05
Total	*64.74	67.49

*A charge amounting to 0.97 per cent of operating revenues was made to expenses for transportation for investment—C., in accordance with the new rules of the Interstate Commerce Commission.

The fact that the Norfolk & Western has availed itself of the Interstate Commerce Commission's rules, which permit charging depreciation on structures in addition to the depreciation which has been charged since 1907 on equipment, has already been mentioned. The charges made are particularly interesting, because the Norfolk & Western is the first road to make a report showing in detail such charges, and only a few other roads, such as the Louisville & Nashville, have been making any such charges at all. President Johnson says in his report: "Your company has availed itself of the permission to set up such accounts [depreciation on property other than equipment], but, to begin their operation conservatively and to avoid large initial charges to operating expenses for depreciation of such property, only the larger structures have been considered, leaving the extension of the plan to cover smaller structures for consideration at a later date when experience shall have more clearly indicated the best permanent course." A total of $643,000 was charged for depreciation under maintenance of way and structures. Roadway maintenance, on which $525,000 was spent, was charged also under the heading "roadway depreciation," $326,000; station and office buildings, on which $113,000 was spent for repairs and renewals, was charged also with $40,000 for depreciation, and shops and engine houses, on which $136,000 was spent for repairs and renewals, was also charged $47,000 for depreciation.

Without any actual inspection of equipment it is impossible to say with absolute certainty whether smaller expenditure means economies or delayed maintenance. On the other hand, the Norfolk & Western's whole policy toward maintenance is so clearly shown in the other figures in the annual report that it is almost inconceivable that a shortsighted policy would be pursued in regard to maintenance of equipment. Furthermore, it is quite unlikely that any such showing for increased trainload could be made if locomotive repairs were not made promptly and comprehensively.

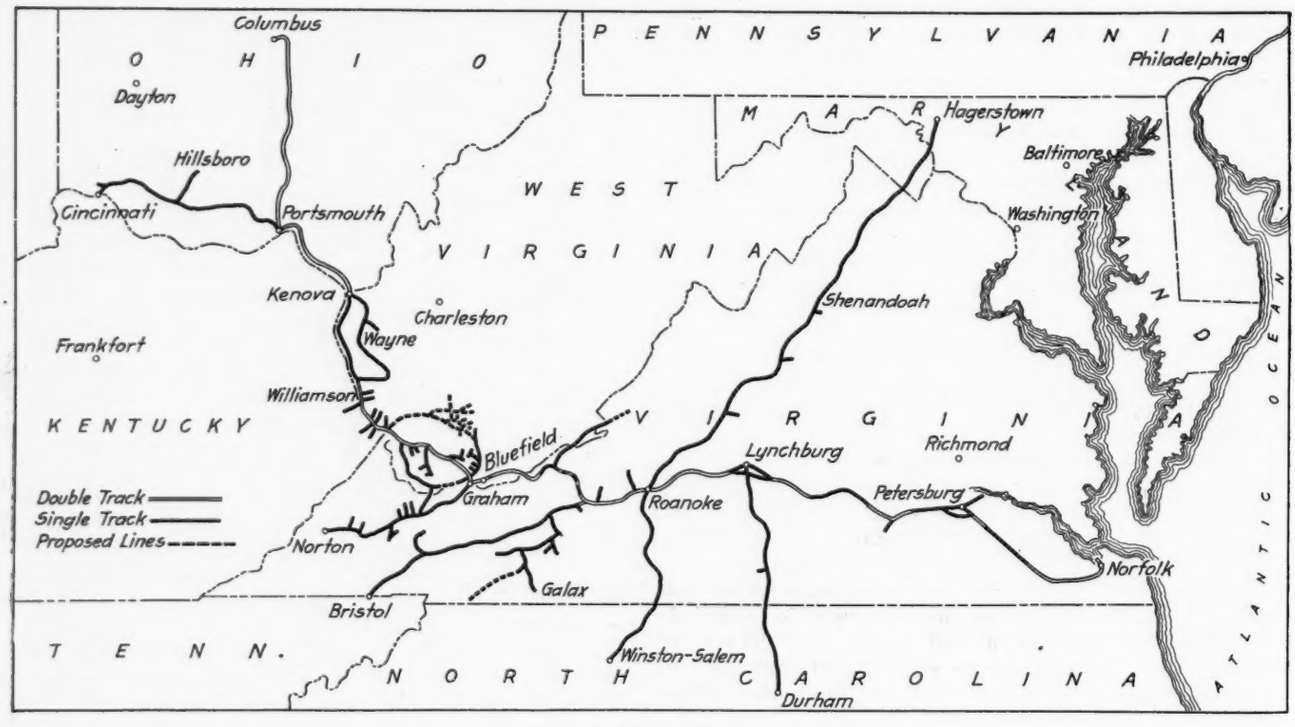
The following table shows the amount spent per unit of equipment and per 100 miles run for repairs, renewals and depreciation in 1915 and 1914:

	1915	1914
Per locomotive	$2,855.00	$3,120.00
Per 100 miles	13.36	12.40
Per passenger-train car	826.00	870.00
Per 100 miles	1.53	1.55
Per freight-train car	91.00	108.00
Per 100 miles	0.90	1.01

The fact that the Norfolk & Western's traffic fell off and the train mileage was reduced to an even greater extent, permitting the use of only the newest and best locomotives and cars, possibly accounts for some of the decrease in repair costs.

The Norfolk & Western spent $6,870,000 for additions and improvements to its property and equipment in 1915. Of this amount $2,017,000 was net expenditure for new equipment, and of the remainder the two largest items were for second track, $1,648,000, and for electric power transmission, $1,636,000. The Norfolk & Western's electrification work was described in some detail in the issue of the *Railway Age Gazette* for June 4, 1915, page 1153.

President Johnson draws attention to the fact that from October 1, 1896, to June 30, 1915, $123,649,000 has been spent on additions to road and equipment, and in addition to this amount $15,474,000 was spent from income for what the Interstate Commerce Commission now classifies as additions and betterments. In other words, in these 19 years investors have put into the property $139,123,000 of new money. The showing made by the company in the year ended June 30, 1915, is a good indication of how wisely this money has been spent.



The Norfolk & Western

The following table shows the principal figures for operation in 1915 as compared with 1914:

	1915	1914
Mileage operated	2,044	2,037
Freight revenue	$36,550,550	$38,038,622
Passenger revenue	4,739,538	4,908,679
Total operating revenues	42,987,044	44,650,310
Maintenance of way and structures	5,738,074	4,998,612
Maintenance of equipment	8,341,419	9,214,007
Traffic expenses	699,827	737,690
Transportation expenses	12,521,665	14,068,577
Miscellaneous expenses	109,468	199,565
General expenses	836,607	916,954
Transportation for investment—Cr.	415,245	.....
Total operating expenses	27,831,815	30,135,407
Taxes	1,878,000	1,620,000
Operating income	13,275,462	12,894,539
Gross income	15,318,696	15,171,921
Net income	10,409,905	10,462,426
Dividends	7,396,293	7,180,592
Surplus	3,013,612	3,281,834

The Interstate Commerce Commission and Its Work*

A Reply to Some Criticisms and a Discussion of Some of the Unsettled Questions Pertaining to Railway Regulation

By E. E. Clark
Member of the Interstate Commerce Commission

In some quarters the tribunal of which I happen to be a member is accused of entertaining, and of exercising, a spirit of hostility toward the railroads. If a railroad, whose financial history has been little, if anything, less than a public scandal from a time that antedates the enactment of the act to regulate commerce, goes into the hands of a receiver, certain publications solemnly announce that it has been forced into bankruptcy through the hostile and unreasonable policy and actions of the Interstate Commerce Commission. If the commission finds that certain proposed increased rates are reasonable, those same writers sneeringly assert that it is a delayed and reluctant granting of but a small part of that which should be granted to the railroads. If the members of the commission disagree as to the propriety of, and justification for, the proposed increased rates, they assail those members who disapprove and laud those who approve. Thus, if a commissioner happens to be on one side in one case and on the other side in another case he is both approved and disapproved.

CRITICISM OF THE COMMISSION

From another quarter we are accused of being desirous of doing only those things that the railroads wish us to do; and the assertions and accusations from that quarter are as extreme and as violent as are those emanating from the quarters first mentioned.

And so, dependent upon the point of view, we are different beings, animated by different impulses and doing things which are diametrically opposed to each other. But is the one who will not see more than one side of a question, who attributes dishonesty to everyone who does not see as he does, and as narrowly as he does, necessarily the only one who sees rightly? Is his point of view infallible? May not some of his conclusions or deductions be wrong?

I remember reading when a boy a poem which described the trip of six blind men of Hindustan to see an elephant. The first approached the animal and happening to fall against its side exclaimed, "Why, bless me, but the elephant is very like a wall." Another chanced to grasp the elephant's tusk and asserted that the beast was like a spear. The one who came in contact with the elephant's ear declared that the animal was like a fan; the one who grasped the elephant's tail was sure that the elephant was much like a snake; the one who laid hold upon the elephant's trunk was certain that the animal resembled nothing but a tree, etc.

> And so these men of Hindustan
> Disputed long and loud,
> Each in his own opinion
> Exceeding firm and strong,
> Though each was partly in the right
> And each was in the wrong.

Every nation or people has a national sport, pastime or game. I have long known that in the United States we had two national games. The first is played in small parties, and generally in private. Of that one I will only remark that no one cares to play with the man who continually grumbles because he cannot win every pot. The second, baseball, is played in public; the crowd is always with the home team, and many of the onlookers find their greatest enjoyment in roasting the umpire. Of late I have been almost inclined to think that a third pastime —finding fault with the Interstate Commerce Commission—is becoming so popular as to be almost national, and I am disposed to pattern after the manager of a Texas baseball team, who appealed to the crowd, "Don't shoot the umpire, he is doing the best he can."

But, seriously, the questions which you gather together to discuss, and with which you deal, are parts of a problem of tremendous importance. Transportation is the very life blood of the commerce of the nation. The railroad industry of this country is probably, with the exception of agriculture, the greatest of our industries. Efficient and adequate railroads are essential to the maintenance and expansion of our commerce. Under our plan of private ownership, railroads have been, are, and will be built only when those who promote and further the enterprise have faith that in due time it will be profitable. Excepting the lands which were granted to some roads, a railroad has only transportation to sell and no other source of revenue. The railroad company, created by public grant of franchise, is obliged to assume certain obligations, among them the regulation by public authority of many of its affairs, and is given certain privileges and guarantees, among them the right of eminent domain and protection against confiscation of its property through regulation or other means.

It must submit to regulation because otherwise, as has been amply demonstrated, unjust discriminations, undue preferences and unreasonable rates would be indulged in and imposed, and commerce, instead of flowing in natural channels, would thrive or languish according to the will of those who possessed the transportation facilities. Business, manufacturing, producing and marketing would all be subject to artificial domination and control. It must be accorded the right of eminent domain, as, otherwise, spite and greed would throw insuperable obstacles in the way of its construction. It must be protected against confiscation because it is, after all, private property which the public has no right to use except upon the payment of reasonable compensation.

I do not doubt, and I have never doubted, the willingness of the great majority of the people to pay reasonable compensation for reasonable and proper service. I do not doubt the willingness of the great majority of those who manage the affairs of our railroads in these days to furnish good service in return for reasonable compensation. The difficulty comes in the difference of opinion as to what is reasonable compensation, either as a whole from all of the traffic, or in individual instances. These differences are often so acute that they must be decided by some disinterested, impartial tribunal, and manifestly they should be heard in an open forum in which all parties' rights are respected and protected.

THE COMMISSION DOING THE BEST IT CAN

Under our form of government these questions, in so far as they do not involve confiscation of the carriers' property, are within the jurisdiction of the legislative branch of the government. Acting within its lawful powers, the Congress has delegated certain authority to a body created for the purpose of deciding controverted questions of unreasonable, unjustly discriminatory or unduly preferential rates, rules, regulations or practices. That body, like the Texas umpire, is doing the best it can. I do not mean that it is doing the best it can to please everybody. It does not aspire to accomplish the impossible. It is doing the best it can to discover and establish that which is right, reasonable and just. It stands with its face to every wind that blows, decides the questions that come to it in a judicial spirit, endeavors to be helpful when it can in promot-

*Address before the National Industrial Traffic League, at Toledo, Ohio, on September 9, 1915.

ing harmony and thorough understandings between the carriers and their patrons, and does not worry about whether or not its decision or action is going to be popular.

The act to regulate commerce has been on the statute books since 1887, but it can fairly be said that real regulation under it dates back only to 1906 when by amendment the act was given vitality. The problem was not then, and is not now, to devise a model system of rates and regulations for railroads not yet built, or for industries and communities not yet located or developed. The conditions of trade and transportation that had grown up in a rapidly developing country served by railroads that had always been operated as private industries, free from governmental control, each going its own way in accord with the policy or ideas of those who for the moment were in control of it, had to be dealt with.

I think the court was perfectly right when it said that the purpose of the act was to promote and not to hamper trade and commerce. We may see situations and conditions which are wrong and which apparently should be corrected. But if, upon thorough investigation, it is demonstrated that in order to correct it other situations equally as bad, or worse, will be created, no real progress is made by forcing such action. The conditions which the law was enacted to correct or overcome did not grow up in a day and they cannot be corrected or overcome in a day without doing inestimable and irreparable injury. The evils at which the law is aimed were not created by one party to the transactions. No railroad official ever paid a rebate except to some receptive shipper. The ideal situation cannot be attained except through a general disposition and desire on the part of both railroad officials and shippers to support and observe the principles which form the foundation and cornerstone of the law. Just such associations as yours and the various traffic clubs of the country assist in getting men to think alike, and when they think alike, there is little trouble about getting them to act alike. The solution of these profoundly important and far-reaching problems must be approached and dealt with in a broad way. The foundation must be laid in sound principles of right. If a railway company imposes wrongs upon, or deals in bad faith with, an individual or a community, its owners may expect hostility against the company and its interests. If a shipper defrauds or attempts to defraud the railway company by falsifying as to his shipments or his claims he cannot expect its officers to attach much importance to his representations in a matter that is of real importance to him, and in which his contentions are right. Every temporary or transient advantage that is secured by trickery or by evasion of truth and right retards the progress toward the conditions which we all should seek to enthrone.

The law provides that the patron of the railway shall be accorded reasonable and nondiscriminatory rates and service. If he has been charged an unreasonable rate or has been damaged by an unlawful discrimination he may recover reparation. If the railway maintains an unreasonably low rate it cannot repair losses sustained as a reason thereof on past transactions. If the railway maintains unreasonably low rates as to some traffic or as to some communities, it may not recoup itself by laying unreasonably high charges against other traffic or other communities. This principle has been well established in recent decisions of the courts.

REASONABLE RATE A QUESTION OF JUDGMENT

And this leads to the query, What is a reasonable rate? There is no statutory definition of it. No scales or yard sticks are provided by which it can be weighed or measured. It cannot be determined solely by the cost of the service, because that cost, plus a reasonable profit, might, as to some commodities, be prohibitive. It cannot be measured alone by the value of the service, because that would open the way for the railway to absorb, as to some traffic, the profits that legitimately belong to the shipper. It cannot be ascertained from a consideration of distance only, because so to do would destroy competition between producing fields and in common markets. In the last analysis it is a question of judgment, and very properly, the judgment that finally controls is that of a disinterested, impartial tribunal, whose decisions must be made only in the light of full hearings and proper investigations, and are, as to matters of law, reviewable in the courts.

Some questions, which to my mind are of fundamental importance, remain to be decided by the commission and the courts, or to be disposed of by the Congress.

SOME UNSETTLED QUESTIONS

As I have suggested, the laws guarantee the owners of the railways against confiscation of their properties. What constitutes confiscation? What is the reasonable profit which the railway may lawfully demand? Upon what property may that profit be based? I think that the courts have clearly laid down the principle that the carrier is entitled to earn a reasonable return upon the property that is devoted to the public use, as of the time of its use. Now come the questions, What is the value of the property, and how is it to be determined? Certainly not by figuring a return upon the outstanding bonds and stocks. Two railroads may have been built in a common territory, under substantially similar conditions, at approximately the same time, and should have cost approximately the same per mile. Throughout its construction and operation one of them may have been conservatively managed and financed as a straight-out business venture, while the other one may have been the prey of graft during construction and of plunder under operation. The capitalization of the one may represent actual investment and outlays, while that of the other may represent all the money that those in control of its affairs have been able to borrow, or to raise by the sale, at ruinous rates of discount and interest, of securities far in excess of the cost or value of the property, or of stocks that can never have any value.

Being in common and competitive territory, their rates must, under the law of competition, be the same. Will any one say that the capitalization of these properties forms any reasonable basis for determining what they may properly earn from serving the public?

Within a period of two or three years in proceedings before the commission and the courts, one railway company proved by witnesses several different valuations of its property, and the differences in those valuations exceeded one hundred million dollars. The item of interest during construction was variously shown in sums which differed so widely that it seemed obvious they were not taken from any records which were considered reliable or permanent.

Such experiences as this led to the conviction that an official and dependable valuation of the railway properties should be had, and by authority of the Congress that work has been undertaken. The law which was adopted for this purpose is exhaustive and requires the performance of a vast amount of detail work and the determination of many vexed and vastly important questions. No one has blazed the path. The results ought to be sound, equitable and right. When these valuations are finally fixed they will be of great assistance to the commission and to the courts in connection with cases which involve alleged confiscation of property of carriers. It will not be possible for each railroad to earn the same return upon the value of its property, because controlling competition in transportation and in commercial life will require substantially equal charges in competitive territories, and we have so many railroads and such a vast commerce that there is not much territory that is not competitive.

THE RECENT WESTERN RATE ADVANCE CASE

There are those who think that if the railroads in a particular section of the country can, as a whole, show that their net return from operation is unusually or unduly low they should all be permitted to increase their charges on all of the traffic or upon important parts thereof. If all of those roads had been constructed, financed and operated on business principles and as

business concerns, and the net results of their operation showed an improperly low return, I would find no difficulty in accepting the view that they were justly entitled to such increases in their charges as would render their operation properly profitable. But in such a case the tribunal that authorized such an increase should have the power also to fix the minimum rate so that the burden might not be inequitably distributed. The carrier has a right to fair compensation for each service performed by it, and for its services as a whole. The public should pay such compensation. The carrier is entitled to earn a profit from legitimate enterprise and effort, but when it comes to increasing rates in general or upon an important part of the traffic, I find difficulty in accepting the theory that because certain roads are in financial straits, all roads in that section may properly increase their rates, when the greater number of those roads have for a series of years been able, under existing rates, to maintain their properties in splendid condition, pay all fixed charges and taxes, declare each year handsome dividends upon their stocks, and carry rather liberal sums to their surplus accounts.

I do not wish to draw invidious comparisons, but I want to make this point clear. I do not attempt to analyze the reasons for the conditions to which I refer as to some carriers, and I refer only to matters that are public property and common knowledge. The Burlington and the Rock Island systems are very generally strongly competing systems. They have operated in common territory and largely under common scales of rates. The one has maintained in good condition a splendid transportation system, has a strong and healthy financial standing, and has regularly paid fair, if not liberal, dividends to its stockholders. The financial condition of the other, and in general, the reasons therefor, you all know.

And so I say that, while desirous of according that which is right to the carriers as much as to the shippers, one may well hesitate about assuming responsibility for approving large increases in rates for the purpose of relieving a financial strain that is composed of the average of the necessities of such roads as the Burlington, the North Western, the Union Pacific, the Great Northern, the Northern Pacific and the Santa Fe on the one hand, and the Frisco, the Rock Island, the Alton, the Wabash, the Great Western and the Missouri Pacific on the other hand.

The commission has consistently declined to prescribe rates based alone upon the favorable conditions obtaining as to the short line and the strongest, richest carrier. It should, of course, decline to approve rates based only upon the conditions and needs obtaining upon the line of the carrier that is poorest and that has an unfortunately located line.

UNITED STATES HAS BEST RAILROAD SERVICE

I have traveled some upon the railroads of Europe. They have some roads which, for those countries and for the services demanded from them, are excellent, well-equipped transportation agencies, which perform an acceptable service. They would not, however, be able to meet the demands in our country. Taking into consideration circumstances and conditions I think that we have the best railroad service in the world. There are many improvements that might be made, and some that ought to be made, but in general it is good and efficient.

The latest figures available show that the charge for the transportation of freight is much lower per ton-mile in the United States than it is in other countries. Glancing over comparative figures for recent years we find that the ton-mile revenue in various countries is: United Kingdom of Great Britain, 2.39 cents; Germany, 1.37 cents; France, 1.3 cents; Austria, 1.45 cents; Norway, 1.6 cents; Belgium, 1.14 cents; Switzerland, 2.92 cents; New South Wales, 1.76 cents, and South Australia, 1.94 cents; while for the United States it was in 1913, 7.29 mills.

These figures, however, do not tell all the story. Referring to other figures we find that the railroads of the United States move 2,737 tons of freight one mile per capita per annum, while in Germany, where the movement by rail is heavier than in other European countries, the railroads move only 582 tons one mile per capita per annum. I believe it has been recognized by successful business men that a large volume of business with a small profit on each transaction is more desirable than a small volume and larger profits on each deal.

The railroads of Europe are capitalized much more heavily than are those of the United States. They are much more completely equipped with signal and other safety devices than are our roads, and generally their roadbed and stations are more expensively constructed and with a view to more permanency.

In many of those countries the railroads are largely or wholly owned and operated by the governments. But on the whole, such ownership and operation has not proven entirely satisfactory, and it certainly has not afforded the people cheaper transportation than could have been furnished under private ownership, properly regulated.

We have 250,000 miles of railroad, serving a broad territory in much of which the commerce and traffic is heavy, and in all of which the commerce and traffic is growing rapidly. We hear much about inducements to build new roads. In my judgment, what is needed is not so much the building of new roads, but the development of those that are already built, so as to make of each an efficient agency, properly equipped with terminals and rolling stock, all maintained in such condition as to afford prompt, dependable and safe service.

If the public demands such roads it must be willing to pay reasonable prices for the services performed by them. If the railroads desire to have and to operate with profit such roads they must convince the public that they are, and are to be, operated along business lines and at rates that fairly compensate for the service performed and yield a fair profit upon the value of the property which is devoted to the public use.

Both the railroads and the public must contribute to the effort to bring about this nearly ideal condition. Each, while guarding its own rights and interests with appropriate jealousy and zeal, must recognize and respect the rights of the other. But even when that is done there will be honest differences of opinion which must be decided by a third party, whose decisions must be based in law and in right, and in whose integrity and fair-mindedness both have confidence.

PROPOSED CHANGES IN INTERSTATE COMMERCE LAW

And now a few words as to changes in the law and in its administration. I know that you are giving attention to these questions and I disclaim any desire or intent to influence your conclusions or actions. I express a few thoughts along those lines for what they are worth.

The Supreme Court of the United States has decided that the courts have no jurisdiction to review a negative order of the commission, and some think that this gives the carriers a right that is withheld from the shippers. Personally I see no reason why the law should not give the shippers the same right of appeal that it gives to the carrier. I do not think that such right would be of great benefit to the shippers. The Supreme Court has laid down the limits within which the courts can review the findings of the commission. The court may inquire whether or not the commission has proceeded lawfully, whether or not its findings are supported by competent evidence, and whether or not its order invades the constitutional rights of the carrier. If the proceeding has been conducted lawfully, and the findings are supported by evidence, and the order does not invade the carrier's constitutional rights, the court may not set aside the order or substitute its judgment for that of the commission.

Of course the shipper has just as much right to a lawful proceeding and a finding based upon competent evidence as has the carrier. The constitutional rights of the shipper are not at all the same as those of the carrier. The law does not attempt to regulate the shippers' selling prices.

As has been seen by the annual reports of the commission,

we think that there is a defect in the law in that the periods of limitation within which the carrier may demand the payment of uncollected undercharges are much longer than the period within which the shipper may bring action for recovery of an unreasonable charge. In a few instances this has caused real hardship.

Conditions that are probably different from those that were anticipated have sprung from the most recently enacted amendment to the act to regulate commerce. It has been strongly urged that the amendment was never intended to apply to shipments by express or to the transportation of baggage. We have been unable to discover any clear indication that it attempts to draw any distinction between carriers by rail and express companies. The Supreme Court had held that that portion of the law applied to the transportation of baggage. Congress knew of that decision and it made no provision in the amendment for excluding baggage from its terms. By the canons of statutory construction, therefore, the law must be held to apply to baggage. If Congress desires to exempt the transportation of baggage and shipments by express from the operation of this provision, it can, of course, effect that by further amendment.

The question of reparation for damage suffered from the exaction of an unreasonable rate or from an unjust dicrimination has been and is one upon which decided differences of opinion are entertained and expressed. The Supreme Court has made it clear that in a discrimination case the damage suffered may be more or less than that measured by the exact extent of the unjust discrimination, and the true measure of the damage suffered must, therefore, be shown by competent proof. There are those who assert that the same rule should be applied in awarding reparation because of the exaction of an unreasonable rate. The commission has not accepted this view, but has held that the one who bears the unreasonable charge has been damaged to the extent that the charge exceeded that which it has been found would have been reasonable.

REORGANIZATION OF INTERSTATE COMMERCE COMMISSION

A good deal has been said and written about the necessity for a reorganization of the work of the commission, or the commission itself. No one realizes more fully than do the members of the commission the magnitude and the complexity of the duties placed upon the commission. The system under which our courts are organized and their several jurisdictions defined is often pointed to as a pattern for organizing the work of the commission. Inasmuch as in ordinary litigation before the courts the parties affected are generally all before the court, while in matters coming before the commission the whole public is interested and many who are not before the commission in the case may be affected by the conclusion reached, we may well doubt the wisdom and practicability of dividing the jurisdiction geographically, with the certainty that at times cases involving substantially the same facts and the same principle will be decided differently in different jurisdictions. The Supreme Court pointed out the impossibility of maintaining the underlying principles of the act if the courts in their several jurisdictions were to pass upon questions of an administrative or a quasi-legislative nature.

The commission has given much thought to this subject and to the various plans that have been suggested for simplifying and expediting the work of the commission and reached the conclusion that the largest measure of relief and the best results would be secured by enlarging the membership of the commission, and authorizing it to divide itself into groups or divisions, each division to have and exercise all the powers of the commission in the matters or cases referred to it. This would give us a mobile but still a centralized body, which could change its divisions and assignments to divisions when and as circumstances might require.

Personally, I feel that the valuation work is of such magnitude and importance and of such a technical nature that a commission or a division of the commission should give their undivided attention to the new and intricate problems which will arise in numbers as that work progresses, and especially as the time for fixing upon a valuation approaches.

The commission can perform the many duties devolving upon it only by thorough organization of its several bureaus and calling to its aid the most competent assistants available. Some features of our administrative work, as for example, the safety appliance features, are so well organized and the principles of those laws are so well defined and established that they give the commission but a minimum of trouble and demand but little of the time of the commissioners. Where work or business expands with rapidity it is not always possible to extend an efficient organization as rapidly as might be wished.

The development of effective and beneficial regulation of the affairs of an industry of such magnitude and vital importance as that of transportation in this country is absorbingly interesting. It inspires one who is actively engaged in the work to bring to it his best thought and efforts. It brings to one a tremendous responsibility, plenty of hard work, and like all public service, more or less unjust criticism. Bearing responsibility does not wear heavily on the one whose heart in is his work and who has the courage of his convictions. Hard work does not hurt one, and unjust criticism, while unpleasant at times, will never affect the judgment or influence the actions of the man whose conscience tells him that he has done the right thing in the light as it is given to him to see.

But, be he never so able, the commanding general cannot win battles without assistants and soldiers, the manager of a successful industrial concern or railroad must have the loyal co-operation of his forces, the executive or administrative official who succeeds must have the cordial support of others who desire to see and participate in his success. And so, in order that those conditions which all right-minded men would be glad to see in the transportation business may be attained and firmly established, it is necessary that you and many others contribute each his part, no matter how small. As the light grows stronger and better days dawn for railroads and their patrons as a result of these efforts, everyone who has contributed to the better order of things by some helpful word or action will experience a sense of satisfaction over a good deed done.

HOURS OF SERVICE ACT INTERPRETED AS TO TELEPHONE COMMUNICATIONS

The United States Circuit Court of Appeals, Seventh circuit, in a case against the Chicago, Rock Island & Pacific, affirms a decision of the District Court for the Northern district of Illinois, Eastern division, penalizing the road for not observing the hours of service law in relation to a switchman in a shanty who regularly telephoned to a towerman, four miles away, informing him whether or not a certain passenger train was on time. The decision is summarized in the following five headnotes, all of which, except the fifth, follow well-known points which have figured in previous decisions:

1. The remedial purpose of the hours of service act (34 Stat., 1415), to protect human life and to promote railroad efficiency, demands that despite its penal character, its provisions shall be construed and the intent of Congress found from the language actually used, interpreted according to its fair and obvious meaning.

2. Congress may well have deemed it unsafe to permit employees whose duty it is, not primarily or principally, but ordinarily and habitually, to transmit orders pertaining to the movement of trains, and in doing so to exercise whatever measure of skill, care, alertness and attention the use of either telegraph or telephone requires, to work 16 hours, however simple or nonfatiguing their ordinary tasks may be.

3. The words in the proviso of section 2 of the hours of service act, "other employee who by the use," etc., transmits orders pertaining to the movement of trains are not to be qualified by an implied limitation to those whose primary and principal duty is thus described.

4. If the particular words "operators and train despatchers" in the proviso of section 2 do not exhaust the class and thus make the rule of *ejusdem generis* inapplicable, the only all-embracing designation covering those concededly within the proviso is an employee who ordinarily and habitually uses the telephone or telegraph for the purposes stated.

5. Switch tenders stationed at a shanty, and whose principal duty is to attend to freight-yard switches, but who also regularly and habitually transmit information by telephone affecting train movements to levermen at an interlocking tower, located at a point where there is a crossing for trains of another railroad, come within the class for whose service limits are established by the proviso in section 2 of the act.

The decision is by Baker, Kohlsaat and Mack, circuit judges; opinion written by Judge Mack. Judge Mack says:

"By this writ of error it is sought to reverse a judgment rendered on a directed verdict and based on six several violations of the hours of service act (34 Stat., 1415).

"Section 2 of the act, after making it unlawful for a common carrier subject to the act to permit employees to remain on duty longer than 16 hours.

"The section of the law applicable to this case says that no operator . . . or other employee who by use of the . . . telephone tranmsits, receives or delivers orders pertaining to or affecting train movements shall be . . . permitted to be on duty for a longer period than nine hours . . . except in certain contingencies not now in question. Violation of the statute is conceded if the employees in question come within the class designated and if the telephone communications made by them are included within the word 'orders' as used in the statute. Four miles north of the switch tender the B. & O. crossed defendant's main line. At this crossing there was an interlocking plant. Defendant's passenger trains were frequently held up at the crossing if it was blocked to let a B. & O. freight train pass. To obviate these delays, it was part of the duty of the switch tender to telephone the towerman at the crossing that defendant's passenger train was coming."

Defendant contended that what the switch tenders did in relation to the towerman was to impart information, not to transmit orders. It concedes, says Judge Mack, that orders are not confined to technical written train orders; that any specific direction or instruction *which a subordinate is bound to obey* would be an order; but it urges that only such orders the violation of which might result in some accident fall within the purpose and therefore within the scope of the statute.

"Unquestionably the important *object of the statute was to conserve the safety of the traveling public* and of railroad employees. *Not merely safety, but general efficiency, promptness of service is thereby promoted.* Concededly greater regularity in the passenger service is secured if the defendant's trains are no longer held up at the crossing. Orders designed to accomplish even this result would, therefore, be within the purview of the act.

"But who can say that the violation of any order pertaining to or affecting train movements *might* not result in some accident? That other measures obviated the possibility of a collision at the crossing is immaterial, for surely regularity of servive at that point might well prevent an accident at some other point. . . ."

A similar decision was handed down the same day in a case against the Chicago & North Western.

THE ORURO-COCHABAMBA RAILWAY OF BOLIVIA.—Work is in progress on the construction of the railway from Oruro to Cochabamba, Bolivia. About 300 laborers are now employed. The rails will shortly be laid as far as Orcoma, a small village approximately 5 miles from Capinota. The distance between Oruro and Cochabamba is 125 miles and Capinota is about 36 miles from Cochabamba.

A DISTANT SIGNAL FOR AUTOMOBILISTS

The Southern Pacific has put in use at Tropico avenue, Tropico, Cal., what may be called a highway distant signal—a conspicuous warning for wayfarers, set about 100 ft. back from the railway.

This signal is of unusual design. Resting on an upright, which consists of a 3-in. iron pipe about 6 ft. high, is a cylindrical tube, 8 in. in diameter and 2 ft. 6 in. long. Its axis is horizontal, in line with the street, and it is painted both inside and outside a jet black. Fixed to the tube several inches from the upright post, as shown in the illustration, is a large circular disk, the front of which is painted red and the back side black. The rear end of the tube is closed, and on the inside, about 18 in. from the open end, is a red glass lens, which fits snugly within the tube. Behind this lens is a powerful incandescent lamp, backed by a brilliant reflector. The wires for the lamp run down through the hollow post and underground to the regular crossing signal, which is a "wig-wag," and also is electrically operated.

The wig-wag and the tube, or distant signal, are both used

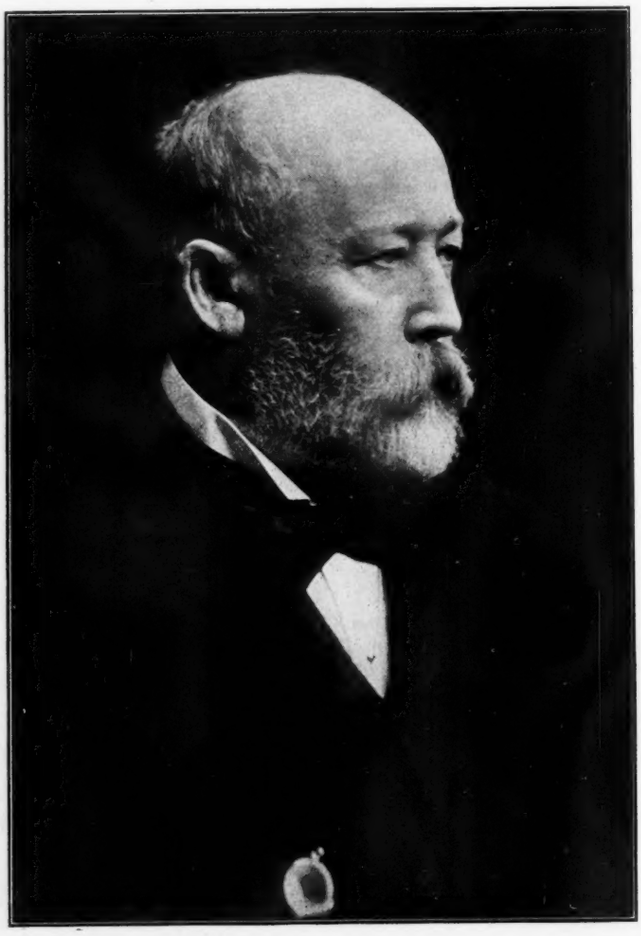
Distant Signal for Automobilists

in daylight as well as at night. With the red lens set so far back in the 8-in. tube the signal can be seen almost as plainly during the daytime as it is in the night. In addition to this, during the daylight hours the large red disk serves to emphasize to the motorist his proximity to the railroad crossing.

There are two of these signals at Tropico avenue crossing, one on either side of the tracks. This double system has been installed only at crossings which are especially dangerous on account of their "blind" approaches or other reason, but it seems to have found much favor already, and the company proposes to install others.

SIR WILLIAM C. VAN HORNE

William Cornelius Van Horne, one of the chief citizens and notable philanthropists of Canada, and active head of the Canadian Pacific Railway during 15 years of the most important period of its development, died at the Royal Victoria Hospital in Montreal, on September 11, at the age of 72. He had been sick but two weeks, though he had been in failing health for several years. Since he relinquished the active management of the Canadian Pacific to Sir Thomas G. Shaughnessy, Sir William has devoted himself to numerous other interests, and, in particular, to the Cuba Company and the Cuba Railroad, of which he was president; but to the readers of the *Railway Age Gazette* he will be remembered chiefly as the general manager, vice-president and president of the Canadian Pacific Railway, one of the first of that notable line of brilliant railway officers who, educated in the United States in the school of experience, were called to official positions on Canadian railroads and rose to be leaders by the sheer force of their individual characters. The railroads of the United States, in the 25 years following the Civil War, constituted the great railroad university of the world, and the owners of the railways of Canada, having very definite needs, were in a position to survey the field impartially and make intelligent selection of the best men, and their judgment in this and other instances was fully vindicated by the results.



Sir William C. Van Horne

The subject of this sketch was born in Will County, Ill., February 3, 1843. His father, a lawyer in Joliet, died when the son was only 13 years old, and at the age of 14 he entered the service of the Illinois Central, at Chicago, as a telegraph operator. He soon went to the Michigan Central and during six years, 1858-1864, held different positions on the Joliet division of that road. From 1864 to 1872 he was on the Chicago & Alton as ticket agent, telegraph operator, train despatcher, superintendent of telegraph, and finally, for three years, division superintendent. In July, 1872, he went to the St. Louis, Kansas City & Northern, now a part of the Wabash, where he was general superintendent for two years. Then for four years he was general manager of the Southern Minnesota, now a part of the Chicago, Milwaukee & St. Paul, and for a time was president of this company. In October, 1878, he went back to the Chicago & Alton, where he was general superintendent, until the end of 1879, when he went to the Chicago, Milwaukee & St. Paul. Here he was general superintendent for two years, when he resigned to go to the Canadian Pacific. For the first four years he was general manager, then from 1884 general manager and vice-president. He was made president in 1888, and chairman of the board on June 12, 1899. This position he held until May, 1910.

It will be seen that he went to the Canadian Pacific about four years before the line of that company was completed to the Pacific Coast, and his name stands among the few leaders in the affairs of the company who are accorded the credit for carrying through that great enterprise. He was knighted by Queen Victoria in the last years of her reign.

Sir William was director in a number of the subsidiary railroad companies owned or controlled by the Canadian Pacific and in numerous other enterprises; the Canadian North West Land Company, the Dominion Iron & Steel Company, the Equitable Life Assurance Society of New York and numerous eleemosynary associations. He took a great interest in art, and in many forms, and was a vice-president of the Montreal Art Association. His house in that city was filled with objects of art collected from all parts of the world; Greek statuary, Oriental pottery, paintings by Spanish and Flemish masters, Chinese porcelain and innumerable other things. He had made with his own hands finely illustrated catalogues of pottery and other things in his collection and had no little ability as an artist.

As an officer of the Canadian Pacific, Sir William was popular. He had a rough and ready way with him and was often called a hard driver; and if things did not suit him could make quite a fuss. But he had a regard for men who did their duty, and he treated them with justice. Extremely hospitable, he never let an officer of the road come to headquarters without paying him some attention, and no matter how crude the man he was pretty sure to invite him to dine at his house. There was little formality about him, either in his office or at his home. He preferred the company of men who worked—artists, artisans, scientists, authors and musicians—to that of men whose interest was solely to make money in business.

Sir William was full of burning energy, which left him few idle moments. He enjoyed perfect health until two years ago; could do with very little sleep, and often stayed up nearly all night; ate prodigiously and was impervious to the cold. He was a mine of information on many topics. In conversation he was most entertaining, though as a public speaker he failed lamentably. With children he was in his element, liking nothing better than to have a frolic with them.

Soon after going to the Canadian Pacific Van Horne invited to follow him Thomas G. Shaughnessy, who had been one of his associates on the St. Paul, and Shaughnessy was soon made general purchasing agent of the Canadian Pacific. He was steadily promoted and in 1899 succeeded Sir William as president. Sir Thomas, speaking of the death of his friend, says:

"From the time that I came to Montreal (1882) till the date of his death, Sir William and I have been intimate business and personal associates, and although in recent years his intersts have been in one direction and mine in another, there is, I feel sure, no person, apart from the members of his own immediate family, who is more grieved by his death than I am. Probably I knew him more intimately than any one else. His was a great mind, a great heart and a lofty soul."

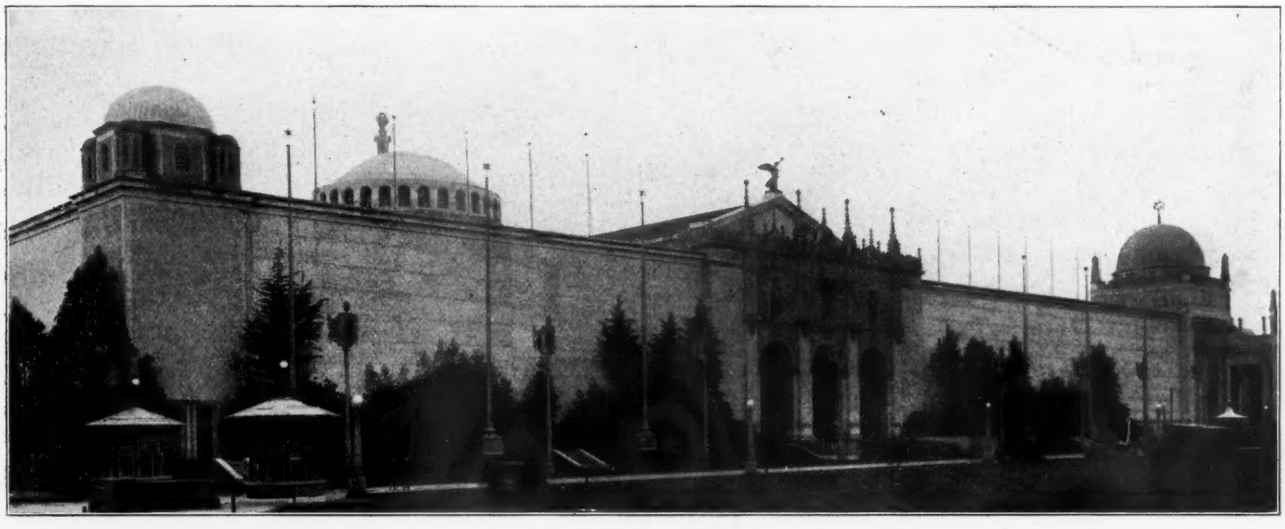
The Railways and the California Expositions

Second Article, Describing Exhibits of Railways and Railway Supply Companies at Panama-Pacific Exposition

Most of the railway and railway-supply exhibits at the Panama-Pacific Exposition in San Francisco are housed in the Palace of Transportation, one of the main group of the exposition buildings. This building and many of the exhibits in it were described in an article by William S. Wollner in the *Railway Age Gazette* of February 26, page 373. The structure covers seven acres and cost $500,000. Unlike the transportation collections at previous expositions it has been the purpose to make this one contemporaneous rather than historical, no display being eligible for award unless it represents a product of the last 10 years, or a product that has not been improved upon within that period. The exhibits in the Transportation Building are under the direction of Blythe H. Henderson, chief of the department of transportation.

Special concessions were offered by the railways in the rates for the transportation of exhibits, by which all articles on which full rates were paid to the exposition may be shipped back without charge, provided the ownership has not been changed.

The building, in addition to railway and supply exhibits, which occupy a little over one-fourth of its space, is also devoted to the exposition of the latest developments in the field of automobiles, steamships and aviation, thus covering transportation by land, water and air. The foreign countries represented include Great Britain, Holland, Japan and China. Of the individual exhibits illustrating American railway progress those of the Westinghouse and General Electric companies occupy the greatest amount of floor space, with elaborate displays of electrical appliances as applied to transportation, including electric locomotives. The exhibit of the Southern Pacific shows the latest devopments in car and locomotive construction, including freight and passenger cars and electric motor cars, the latest type of all-steel postal car, and the huge modern locomotives contrasted with the locomotive first used on the Central Pacific. The Pennsylvania exhibit shows the complexity and many-sided development of the work of a great railway system in all its phases. The exhibit of the western lines formerly comprised in the Gould system illustrates some of the scenic attractions and agricultural possibilities of the West, while the various exhibits of the railway supply companies show the improvement that has taken place in the various appliances for making transportation safer and more efficient.



The Palace of Transportation

RAILWAY EXHIBITS

The Southern Pacific, in addition to the exhibits mentioned in Mr. Wollner's article, also shows in its space in the Transportation Building an interesting collection of photographs and charts illustrating its shop-welfare and safety-first work, and giving statistics showing the great improvement in its safety record. In connection with this a small working model is shown demonstrating in a non-technical way the method of operation of the automatic electric block signal apparatus. There is also an exhibit of articles manufactured in the company's shops; a 60-foot steel coach, the first all-steel passenger coach built in the United States, designed and built by the Southern Pacific in 1905, since which time the construction of wooden passenger equipment has been discontinued by this company; a 58-ft.-all-steel electric motor coach, built by the Pullman Company; a 45-ft.-all-steel street car, with center side entrance, the body built by the Pullman Company. An important contribution to the illumination features of the exposition is an Atlantic type Southern Pacific passenger locomotive, which stands at the Yacht Harbor opposite the Agricultural Building, and at night furnishes steam and smoke which are utilized in conjunction with the exposition's battery of powerful searchlights for the production of striking lighting effects. The Southern Pacific was awarded a grand prize for its exhibits.

The large and interesting educational exhibit of the traffic department of the Pennsylvania system, which was awarded a grand prize, was described in the article of February 26. All of the attendants at this exhibit have been temporarily detached from railroad service. The exhibit is located in the center of the Transportation Building and has proved very attractive to visitors. The attendance at the moving-picture lectures, depicting journeys over the lines of the system, up to August 17, was over 74,000, and it was estimated that during the first five months of the exposition over 2,000,000 people visited the exhibit. Over

70,000 booklets describing the exhibit and the system have been distributed. Among the several models of terminals is one of the proposed new Union Station at Chicago.

The "Globe" exhibit of the Missouri Pacific, St. Louis, Iron Mountain & Southern, Denver & Rio Grande and Western Pacific, shown in one of the accompanying illustrations, was described in the *Railway Age Gazette* of May 28, page 1,133. This exhibit was awarded a gold medal and has been visited by about 3,000 people a day.

The Republic of China has an interesting display of models illustrating the types of equipment and structures used on the government railways, including a typical station, block signals, wooden bridge, passenger train, reserved car, goods car, coal truck, part of Yellow river bridge and the train staff system. This exhibit also includes photographs of views on the lines, charts showing the organization and statistics of the railways, and samples of the uniforms worn by officers and employees.

The Imperial Railways of Japan show a collection of maps and photographs of the government railways and charts of statistics.

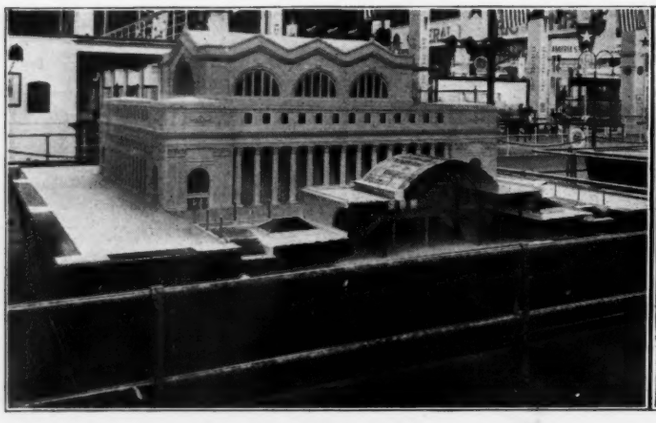
The Wells-Fargo Company has an exhibit consisting of an express office at which travelers' checks were cashed, a lecture room in which motion pictures were shown illustrating the methods of handling the express business, a model of a Wells-Fargo Express refrigerator car, one of the steel trunks used for carrying packages, a clock that was installed in the company's offices in San Francisco in 1867, photographs, old money orders, etc., illustrating the history of the company, an old Concord stage-coach built for the company in New Hampshire in 1863, which was transported to California around Cape Horn, and boxes of fruits, nuts, etc., packed ready for shipment by express.

The separate buildings of the Southern Pacific, Great Northern, Canadian Pacific and the Grand Trunk were described in the issue of September 10.

Two railways, the Atchison, Topeka & Santa Fe and the Union Pacific, are represented on the "Zone" where the amusement concessions are located.

The Santa Fe has a seven-acre reproduction of the Grand Canyon, which took three years to build and cost approximately $250,000. Visitors enter a special observation car which makes stops at seven points, at which are seen reproductions of the view from some of the special points of interest in the canyon from different parts of the rim. An admission fee of 25 cents is charged. The Santa Fe also has a reproduction of a Pueblo Indian village, to which an admission fee of 10 cents is charged.

The Union Pacific space is devoted to a reproduction of scenes in Yellowstone National Park, occupying four acres. The principal feature is a full-size replica of Old Faithful Inn, covering a ground area of 47,000 sq. ft., in which is a dining-room and auditorium, seating over 2,000 persons. Here the exposition orchestra of 80 pieces gives daily concerts and here several banquets have been held by large organizations visiting the exposition. The central space of the enclosure is occupied by a relief topographical map of the park, occupying 50,000 sq. ft., and this is surrounded by reproductions of some of the principal features of the park, built up of burlap and concrete. A Yellowstone trail 1,500 ft. long winds tunnel-like through the mountains disclosing an occasional vista of the Yellowstone landscape and opposite the inn a cataract falls 85 ft., discharging 1,000 gallons of water a minute. Inside of one of the mountains is a large lecture room in which are shown moving pictures of Yellowstone Park scenes. At the close of each lecture the screen is rolled to one side disclosing a reproduction of the upper geyser basin with a number of small geysers spouting steam and every 65 minutes there is a remarkably realistic imitation of the Old Faithful geyser in eruption. An admission fee of 25 cents is charged. Up to the end of July the attendance had reached 125,000.



Model of New Chicago Union Station in Pennsylvania Exhibit

A Contrast in Locomotives in the Southern Pacific Exhibit

RAILWAY SUPPLY EXHIBITS

A large proportion of the railway supply exhibits are shown in the Machinery Building, and some in the Palace of Mines.

The official list of awards has not yet been given out by the exposition officers. Although most of them were determined upon several weeks ago there have been some protests to be acted upon, and while most of the exhibitors have been notified of their awards, all of them have not, and it has been impossible to obtain an accurate list or to show what the awards covered. The awards mentioned in connection with the following list of exhibits are therefore not to be taken as a complete list of awards.

While this is the most complete list of the railway supply exhibits at the exposition that has been published, it may not include some companies that are to some extent engaged in the railway supply field, but whose displays were shown in connection with other departments of the exposition.

EXHIBITS

The exhibits of railway supply companies in the Palace of Transportation are as follows:

Ajax Metal Company, Philadelphia, Pa.—Ajax plastic bronze engine castings on Chicago, Burlington & Quincy locomotives exhibited by Baldwin Locomotive Works. Bronze medal.

American Arch Company, New York, N. Y.—Security sectional arch installed in Atchison, Topeka & Santa Fe locomotives exhibited by Baldwin Locomotive Works. Gold medal.

American Brake Shoe & Foundry Company, New York, N. Y.—Brake shoes and parts and shop photographs showing process of manufacture. Gold medal.

American Locomotive Company, Schenectady, N. Y.—This company's exhibit, which was described in the issue of February 26, page 373, was awarded a medal of honor.

Automatic Folding Fender & Cattle Guard Company.—Cattle guard.

Automatic Transportation Co., Buffalo, N. Y.—Electric tractor trucks and trailers. Gold medal.

Baldwin Locomotive Works, Philadelphia Pa.—This company's company's exhibit, which was described in the issue of February 26, was awarded a grand prize.

J. G. Brill Company, Philadelphia, Pa.—No. 77 E-trucks shown in exhibit of General Electric Company.

Cambria Steel Company, Philadelphia, Pa.—Rails and special track work, structural steel and axles, special axles twisted cold, agricultural steel, wire products, fencing, automobile steel parts, shop photographs and the original Kelly steel converter used in the Cambria Iron Works in 1861 and 1862. Medal of honor.

Chambers Valve Company, New York, N. Y. Chambers throttle valve in equipment of locomotives exhibited by Baldwin Locomotive Works.

Edison Storage Battery Company, Orange, N. J.—Storage batteries, models of signal apparatus showing the application of Edison primary batteries and automatic crossing signals.

Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn.—Fairmont motor car with photographs and blue prints.

Flannery Bolt Company, Pittsburgh, Pa.—Tate flexible staybolts. Gold medal.

Franklin Railway Supply Company, New York.—Franklin fire door shown in the exhibit of the Chinese government railways,

The Globe Exhibit of the Gould Lines

McLaughlin flexible conduits, and Franklin automatic driving box lubricator and Franklin water joint included in equipment of locomotives exhibited by Southern Pacific, Baldwin Locomotive Works and McCloud River Railroad. Silver medal.

Galena-Signal Oil Company, Franklin, Pa.—Various kinds of lubricating and illuminating oils. Gold medal.

General Brake Shoe Supply Company, Chicago. One-piece steel back brake shoes.

General Electric Company, Schenectady, N. Y.—Five types of electric locomotives, including 1280 h.p., 80-ton electric locomotives designed and built by General Electric Company, to replace steam locomotives on Butte, Anaconda & Pacific, designed for operation at 2,400 volts; 780 h.p. electric locomotive for interurban freight and passenger service and heavy switching, designed for operation at both 600 and 1200 volts, direct current; electric mining locomotive for 42-in. gage, 20 tons; electric mining locomotive with three 85 h.p. motors and electric industrial locomotive for yard switching. Railway motors and other apparatus for electric railways. Signal accessory electric devices, electric apparatus and equipment for railway shops, electric illumination for cars, shops, etc. All essential parts of electric traction are demonstrated in operation. Storage battery truck cranes for loading, unloading and carrying articles weighing up to one ton. Storage battery platform trucks designed to run inside of freight cars. Several hundred stereomotorgraph illustrations from photographs of important applications of railway equipment in city, suburban and heavy electrification service, and typical installations of new apparatus.

Griffin Wheel Company.—Griffin F. C. S. wheels for steam and electric railways. Gold medal.

Hewitt Rubber Company, Buffalo, N. Y.—Hewitt seat packing, stitched belting, aisle strip matting and plain belting, armored pneumatic tool hose, M. C. B. standard air brake hose, standard fire hose, water hose, suction hose, corrugated tank hose, boiler washing hose and standard steam hose.

Hupp Automatic Mail Exchange Company, Washington, D. C. Full size mail exchange system in operation delivering and collecting pouches of mail. Gold medal.

Locomotive Stoker Company, New York, N. Y.—Type "C" Street stoker installed on Chicago, Burlington & Quincy freight locomotive exhibited by Baldwin Locomotive Works. Gold medal.

Manganese Steel Rail Company, New York, N. Y.—Various sections of manganese steel rails bent under drop test. Gold medal.

McCord & Co., Chicago, Ill.—McCord journal boxes in equipment of cars exhibited by other companies.

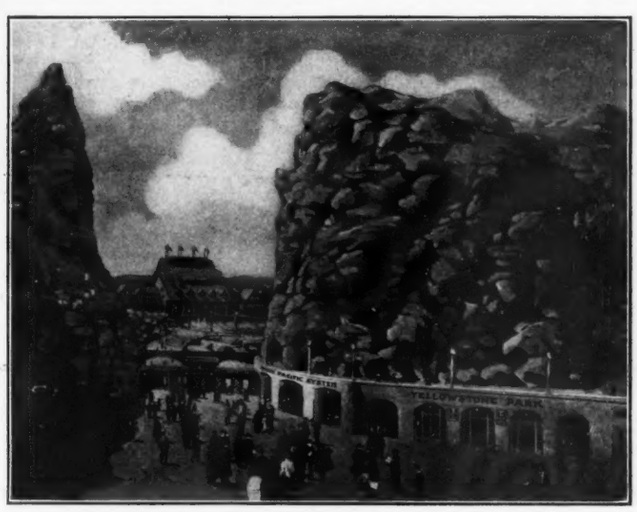
W. H. Miner Company, Chicago.—Draft gears and draft bearings on locomotives and cars exhibited by other companies. Silver medal.

National Brake & Electric Company, Milwaukee, Wis.—Complete installations of brake apparatus on vehicles on exhibition in Palace of Transportation. Complete line of air compressors, portable air compressor, governor reservoir mounted on trucks, 100 cu. ft. alternating current motor-driven compressor in operation supplying air for various purposes throughout the exhibit, complete line of motorman's operating valves, compressor governors, and other detail parts of brake equipment.

National Malleable Castings Company, Cleveland, Ohio. M. C. B. couplers and journal boxes for freight cars, passenger cars and locomotives; half and three quarter size couplers for industrial equipment, brake equipment castings, coupler pockets, draft gear yokes, rail braces, rail anchors and tie plates, castings of malleable iron, open hearth steel and electric steel. Medal of honor.

New York Air Brake Company, New York, N. Y.—Electropneumatic air brakes for passenger service. Complete equipment for 12-car passenger train with locomotive and tender. Grand prize.

Ohio Injector Company, Chicago, Ill.—Ohio injector, lubricator, flange oiler, cab squirt, combination boiler check and stop valves, intermediate lift check valves on Pacific type locomotive exhibited by the Baldwin Locomotive Works. Similar equipment



Union Pacific Exhibit at Panama-Pacific International Exposition

and hose strainer and Globe valves for oil burners. Chicago Class A lubricator on Mikado type.

Ohio Locomotive Crane Company, Bucyrus, Ohio.—Ohio locomotive crane used to unload and place heavy exhibits and for work in construction of exposition buildings. Bronze medal.

Parkesburg Iron Company, Parkesburg, Pa. Charcoal iron boiler tubes on Mikado locomotive exhibited by Baldwin Locomotive Works. Bronze medal.

Pennsylvania Steel Company and Maryland Steel Company, Philadelphia, Pa.—Mayari nickel chrome steel from Cuban ore, 1⅛ in. frog bolts turned down to ⅛ in. in diameter at a tension of 2,345 lb. Bonzano rail joints, Pennsylvania 125 lb. section, rail sections; sketch of Memphis bridge over Mississippi river, of which over one-half is of Mayari steel, the first use of nickel chrome steel for bridge construction. Samples of tested steel showing physical properties, switch stand track tools of Mayari steel, frogs and shop photographs. Medal of honor.

Pressed Steel Truck Company, Pittsburgh, Pa.—Atlas pressed steel hand trucks.

Pullman Company, Chicago.—This company built the all-steel postal car exhibited by the Southern Pacific, which is the first

car built under the latest revised specifications of the postoffice department.

Rail Joint Company, New York, N. Y.—Continuous, Weber, Wolhaupter, one hundred per cent. continuous insulated, Weber insulated, continuous girder and Weber girder rail joints.

Sargent Company, Chicago. Iron clad safety water gage used on Baldwin Mikado type locomotives exhibited by McCloud River Railroad. Honorable mention.

St. Louis Car Company.—Various types of electric railway street cars. Gold medal.

Standard Steel Works Company, Philadelphia, Pa. Steel tires, wheels, castings, springs and flanges used in locomotives and cars exhibited by other companies. Gold medal.

Taylor Portable Steel Derrick Company, Chicago, Ill.—Taylor portable steel derricks in operation on gondola car and photographs showing various uses.

Union Switch & Signal Company, Swissvale, Pa.—This company has two exhibits in the Transportation building, one consisting of eight "T-2" top-post, four fixed-arm and two position-light signals, illustrating the operation of the absolute block, permissive block, automatic block, distance switch and automatic position light signals, operated by alternating current. The other includes styles B and S signals, the former being a two-position lower quadrant signal and the latter a three-position upper quadrant signal, both operated by Edison primary batteries. Gold medal.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—A 4,000 hp. articulated Westinghouse electric locomotive, as used in Pennsylvania tunnels under the Hudson river, mounted on 65 ft. steel deck turntable rotated by electric motor, and making complete revolution each minute. Photographs of electric lines, trolley line material, insulating cloth and paper, voltmeters, outdoor sub-stations, railway motors and control euipment and lightning arresters.

William Wharton, Jr., & Co., Inc., Philadelphia.—Tioga Iron & Steel Company, Philadelphia, and Taylor-Wharton Iron & Steel Co., High Bridge, N. J. Manganese steel pointed split switch. O'Brien insulated switch rods, built-up frogs, solid manganese steel 100 min. radius tongue switch and mate and 30 deg. frogs. Manganese steel center 150 minute radius tongue switch and mate and 11 deg. frogs. Manganese steel frogs. Standard manganese steel center frogs. Solid manganese steel, steam over electric crossing frogs. Gold medal.

The exhibits of the German-American Car Company, the McCloud River Railroad and the California Despatch Lines, described in the article of February 26, were awarded silver medals.

The following exhibits are located in the Machinery Building:

American Rolling Mill Company, Middletown, Ohio.—Armco Iron Culvert Manufacturers' Association. Iron culverts.

E. C. Atkins & Co., Inc., Indianapolis, Ind.—Saws, saw tools, machine knives, handles, specialties, etc.

Automatic Transportation Co., Buffalo, N. Y.—Freight, baggage and industrial trucks. Gold medal.

Barrett Manufacturing Company, New York, N. Y.—Barrett specification roofs.

Brown Portable Elevator Company, Chicago, Ill.—Portable and sectional conveyors, pilers and unloaders.

Carborundum Company, Niagara Falls, N. Y. Carborundum abrasives; materials cut, ground or finished with carborundum products. Large grinding wheel of carborundum 78 in. in diameter, 8 in. thick, weighing 2,500 lb.

Ceresit Waterproofing Company, Chicago, Ill.—Concrete waterproofing with Ceresit waterproofing compound.

Edison Storage Battery Company, Orange, N. J.—Storage batteries.

Gold Car Heating & Lighting Company, New York, N. Y.—Steam, vapor and electric heating system, thermostat control, cyclone and window ventilators.

Golden-Anderson Valve Specialty Company, Pittsburgh, Pa.—Golden-Anderson valves and steel water towers.

Hauck Manufacturing Company, Brooklyn, N. Y.—Oil burning appliances.

Joyce-Cridland Company, Dayton, Ohio.—Lifting jacks for railway and industrial service. Track jacks.

Locomotive Superheater Company, New York, N. Y.—Schmidt superheaters for locomotive and marine service.

Lunkenheimer Company, New York, N. Y.—Valves.

MacLeod Company, Cincinnati, Ohio.—Carbide lights, portable oil burners, rivets, forges, tire heaters, oxy-acetylene apparatus and paint sprayers. Honorable mention and silver medal.

Morton Manufacturing Company, Muskegon Heights, Mich.—Morton draw-cut shapers.

Muggley Wheel Corporation, New York, N. Y.—Muggley differential car wheel.

Pennsylvania Metallic Tubing Company, Philadelphia, Pa.—Flexible tubing.

Pyrene Manufacturing Company, New York, N. Y.—Fire extinguishers.

Safety Car Heating & Lighting Company, New York, N. Y.—Pintsch gas and electric axle lighting systems.

St. Louis Steel Foundry Company, St. Louis, Mo.—Girder frog, mate and switch, steam over electric railway crossing. Exhibited by Parrott & Co., agents, San Francisco. Two bronze medals.

Standard Underground Cable Company, Pittsburgh, Pa.—Power cables, insulating cables and copper clad wire.

Warner & Swasey Company, Cleveland, Ohio.—Machine tools.

Waterloo Cement Machinery Company, Waterloo, Iowa.—Little Wonder concrete mixers.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Air brakes and air compressors.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Parsons steam turbine, condensers, motors and other electrical apparatus.

United States Steel Corporation

The exhibit made by the United States Steel Corporation and its subsidiary companies is one of the largest in the entire exposition, as well as one of the most complete industrial exhibits ever made. This company's display occupies more than one-fourth of the entire exhibit space in the Palace of Mines. Twenty-six subsidiary companies are represented, 11 manufacturing, 5 mining and coke producing, 9 transportation and 1 selling corporation.

In addition the Bureau of Safety, Sanitation and Welfare presents an exhibit for all of the subsidiary companies. Every process in the manufacture of steel from the mine to the finished product is demonstrated either by photographs, models or the actual product, and in addition a series of motion pictures accompanied by a lecture gives "The Story of Steel from the Mine to the Finished Product." The exhibits of the mining, dock and steamship companies include relief maps, models and photographs illustrating the taking of ore from the mines and its transportation to the blast furnaces. Some of the exhibits by the subsidiary companies include the following:

American Bridge Company, New York, N. Y.—General view photographs and bottom chord sections of arch of the Hell Gate bridge. Photographs of the Panama Canal showing materials supplied. I-bars as used in new Quebec bridge. Locomotive turntable.

American Sheet & Tin Plate Company, Pittsburgh, Pa.—Models, specimens, photographs and lantern slides showing the sheet steel used for building construction, farm structures, railroad cars, etc.

American Steel & Wire Co., New York, N. Y.—Wires and cables as used for agricultural purposes, electric railways, signaling, aerial tramways, telegraph and telephone, reinforcing for concrete, also barbed wire, nails, spikes, staples and tacks, wire rope, electrical wires and cables, horse shoes, rail ties, round, square and odd-shaped wires and shafting for manufacturing purposes, flat wire and springs, music wire, wire hoops and sulphate of iron.

Carnegie Steel Company, Pittsburgh, Pa.; Illinois Steel Company, Chicago, Ill., and Tennessee Coal, Iron & Railroad Company, New York, N. Y.—Models of coke ovens in operation. Models of blast furnace operation. Steel making and rolling mill operation. Testing laboratory and finished steel exhibit.

Lorain Steel Company, Lorain, Ohio.—Special track work exhibit, consisting of various types and models of rails in tracks designed for use by electric street and interurban railways, track layouts and electric welding.

National Tube Company, Pittsburgh, Pa.—Samples illustrating each phase of the welded tubular industry, including Shelby Seamless steel products and Kewanee products.

Universal Portland Cement Company, Chicago, Ill.—Cement products and photgraphs, models, etc., illustrating the manufacture and various uses of cement and concrete. Transportation line photographs showing bridges, railroad yards, shops, tracks and trains.

United States Steel Products Company, New York, N. Y.—Models of steamships owned and operated by the company, map of location of branch offices and agencies in routes covered by steamship lines and sales booths.

The exhibit of the United States Steel Corporation was awarded a gold medal. The awards for the exhibits of the various subsidiary companies were described in the *Railway Age Gazette* of September 10, page 487.

RAILROAD AID TO GALVESTON

That railways often do notable public service outside their usual functions as carriers of persons and property, and that in many communities the public spirit of railway officers is one of the people's valuable assets, is well known to those who take an interest in matters of this kind. This was strikingly illustrated on the occasion of the recent Galveston storm and flood, officers of the Southern Pacific (Sunset Route) and the Santa Fe restoring the water supply of the city when its 40,000 people were dependent for fresh water almost entirely on supplies brought from the mainland by boats. Noticing in Texas papers commendatory references to the railroads' activities we inquired of an officer of one of the roads concerned as to what had been done, and from his reply take the following narrative:

The city is supplied with water from Altaloma, on the mainland, about 18 miles distant, through a cast-iron main 30 in. in diameter. Previous to the construction of the causeway across the bay, three years ago, the water pipe lay on the bottom of the bay about 600 ft. from the causeway. When the causeway was built a new 30-in. line was laid in the roadway, with gate valves at each end.

The storm of August 16 and 17 caused bad breaks both at the north and the south ends of the bridge. (The bridge proper is 2,437 ft. long, with earth approaches at the north end 2,647 ft. long, and at the south end 3,558 ft. long. The earth roadway was washed out in a number of places, so that the pipe had dropped and was covered with some two feet to seven feet of water.

The city government had such a multiplicity of perplexing problems on its hands that the water system was not attended to very promptly, but when finally the valves were set to turn water into the pipe on the bottom of the bay, it was found that this also was broken.

The railroad men met in Galveston on Friday evening, the 20th, F. G. Pettibone, vice-president and general manager, representing the Gulf, Colorado & Santa Fe., and I. A. Cottingham, assistant general manager, in charge of engineering, representing the Galveston, Harrisburg & San Antonio. There was also present John Sealy, a prominent banker of Galveston and president of the Galveston Wharf Company. It was at once seen that the restoration of the 30-in. pipe was a task of much magnitude, and Mr. Cottingham suggested that an 8-in. pipe be laid across the causeway. This was believed to be practicable, because although the earth roadway was badly washed the sheet tiling was nearly or quite intact throughout.

While Mr. Cottingam was at the causeway about noon on the 21st a committee of citizens came out in a boat and handed to him a letter, addressed to Mr. Pettibone and himself, giving them full power in the matter of securing a supply of water and authorizing the necessary expenditures.

Measures were at once taken to secure a supply of 8-in. pipe. In the meantime it was made certain that the line across the bottom of the bay could not be used, about 800 ft. of it having been carried away.

Officers of the Southern Pacific at Houston, summoning the shop and other forces of the company at that city, had two miles of iron pipe loaded on the cars in that city on that day (Saturday) and by daylight the next morning (Sunday) had this pipe in Texas City. This was the nearest point that could be reached by rail, and from here the pipe had to be taken the eight miles to the bridge by a barge. The work of loading the barge could not be done rapidly, and the tug which towed it broke down in the middle of the bay, but the pipe finally reached the causeway Sunday night. Here there was further ill luck, the barge running aground; but the pipe was finally delivered Monday morning, and by that time large forces of bridge men and other workers with tools had been brought to the ground by the Southern Pacific and the Santa Fe.

The men began distributing the pipe at daylight Monday morning, and by 9 o'clock were putting some of it in place. The workmen were divided, and gangs of pipe layers were put at work at five places. As the gangs met the sections of 8-in. pipe were connected by means of sleeves made of pieces of 10-in. pipe, sealed with lead joints.

The length of pipe laid at the north end was 3,700 ft., and at the south end 1,700 ft. On the bridge proper the 30-in. pipe was all right, and the 8-in. line was connected with this at the ends by plugging up the ends of the large pipe and tapping the smaller pipe in the center of the plug. The plugs were made in the Houston shops of the Southern Pacific, out of boiler plates. These plugs were finished late on Sunday night and sent to Texas City by a special train. The line was nearly completed, ready for the water to be turned in on Tuesday at 10:30 a.m., but just then there came up a heavy rain, with strong wind, which necessitated suspending the work for over two hours. Several hours more were used up because of some difficulty on the part of the forces of the city in managing the valves at the south end, but water was finally turned on about 7 p.m. Tuesday.

The 8-in. pipe was, of course, too small to meet all of the needs of the city, but it supplied more than 2,000,000 gal. a day and furnished water in the lower stories of buildings throughout the city; this enabled the electric light and the street car companies, as well as many other industries, to resume operations.

TRAIN ACCIDENTS IN AUGUST [1]

The following is a list of the most notable train accidents that occurred on railways of the United States in August, 1915:

COLLISIONS

Date	Road	Place	Kind of Accident	Kind of Train	Killed	Inj'd
4.	N. Y., N. H. & H.	Atlantic	rc	P. & P.	0	13
*4.	Atchison, T. & S. F.	Richfield	bc	P. & F.	3	6
5.	Balt. & Ohio	Wash'n. C. H.	xc	P. & F.	0	9
†12.	B. & O. S. W.	Orient.	rc	F. & P.	7	16
13.	Boston & M.	Fitchburg.	rc	F. & P.	0	0
27.	Int. & G. N.	Mart, Tex.	bc	P. & F.	1	14
28.	Norfolk & W.	Gary, W. Va.	bc	P. & F.	1	22
30.	Boston & M.	Revere.	xc	P. & F.	0	1

DERAILMENTS

Date	Road	Place	Cause of Derailment	Kind of Train	Killed	Inj'd
2.	Denver & R. G.	Moark, Utah.	Malice.	P.	0	15
3.	Pennsylvania	Church Hill.	Slide.	P.	2	5
4.	Ches. & Ohio	Pottomoi.	Malice	P.	0	0
5.	Norfolk & W.	Swords Crk.	Unx.	F.	2	3
5.	Del. & Hudson	Olyphant.	D. track.	F.	1	0
9.	Pennsylvania	Elders, Ind.	Malice.	P.	2	4
12.	Pennsylvania	Titusville.	D. switch.	P.	0	27
†17.	Ches. & Ohio	McCorkle.	B. rail.	P.	4	8
19.	Western Pacific	Halleck, Nev.	B. truck.	P.	0	25
20.	Fort Worth & D. C.	Quanah, Tex.	D. switch.	P.	0	8
†21.	Georgia & Fla.	Swainsboro.	D. track.	P.	1	8
†27.	Atchison, T. & S. F.	Date Creek.	Flood.	P.	4	17
30.	Mobile & Ohio	Tibbee.		F.	1	0
30.	Chicago & Alton	Rush Hill.	Unx.	P.	0	21

The trains in collision at Atlantic, Mass., on the 4th were a northbound local passenger train and a northbound suburban express, the express running into the side of the rear car of the local. The local was moving at low speed through a cross-over and the express was running about 35 miles an hour. The rear car of the local, a baggage car, was overturned and the next car, a combination baggage and passenger, was considerably damaged, but there were no persons in the rear car, and but a few in the next one, and the total number of injuries is reported as 13, all slight. The engineman of the express appears to have disregarded a stop signal.

The collision near Richfield, Cal., on the 4th was caused by a runaway freight car, which had escaped control on the Olinda branch and had run, at high speed, to the main line, at Richfield. Moving eastward at very high speed, it crashed into the head of westbound passenger train No. 51, consisting of a locomotive and three cars. The freight car contained oil, which immediately took fire, and the wreck was mostly burned up. An express messenger was killed, the engineman and the fireman were fatally injured, but the passengers escaped with minor injuries.

In the collision at Washington Court House, Ohio, on the 5th, westbound passenger train No. 105 of the Baltimore & Ohio

[1] Abbreviations and marks used in Accident List:

rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Southwestern, was struck by a Cincinnati, Hamilton & Dayton freight train at the crossing of the two railroads, turning a Pullman car of the passenger train down the embankment and damaging the engine of the freight train. Seven passengers, the Pullman conductor and the engineman of the freight train were slightly injured. The collision was due to an error in judgment on the part of the freight engineman, who miscalculated the distance and the weight and speed of his train.

The trains in collision at Orient, Ohio, on the morning of the 12th, about 3 o'clock, were a southbound excursion train and a through freight train following it. The excursion had been stopped to take water and the freight train ran into the rear end of it. Seven passengers were killed and 16 injured. The collision was due to excessive speed on the part of the freight train, which had been warned that the passenger was ahead of it. It appears that the passenger train had been delayed by washouts and had consumed an hour and twenty minutes in covering a distance of 13 miles. The flagman had flagged the freight three times and, having notified the engineman of the freight that the passenger would stop at Orient for water and to let off passengers, had not thrown off fusees approaching that point; and he had not gone far, if at all, with red signals after stopping. The freight approached on a descending grade. It was running under rule 108, which allows a freight train, following a passenger train from a non-telegraph station, to leave such station ten minutes behind the passenger and to run under control to the first telegraph station.

The trains in collision at Gary, W. Va., on the 28th were westwestbound local passenger train and a locomotive without train which had escaped control at East Fitchburg and had run at high speed, unattended, to a point west of the station, where it struck the passenger train, crushing the rear platform. No person was injured. The passenger train had been standing in the station, but was warned of the coming runaway engine and had started forward. The rear car was empty. How the locomotive escaped control has not been determined.

The collision at Mart, Tex., on the 27th was due to a misplaced switch. A northbound passenger train ran into some freight cars standing on a side track. A trespasser was killed and 13 passengers and the fireman were injured. The responsibility for the misplacement of the switch has not been fixed.

The trains in collision at Gary, W. V., on the 28th were westbound passenger No. 1 and an eastbound freight. Both engines and several cars, including two passenger cars, were badly damaged. One fireman was killed and 21 passengers were injured.

The trains in collision on the Boston & Maine at Revere, Mass., on the 30th were a northbound passenger and a freight which was using a crossover without proper authority. Two freight cars were ditched. One trainman was injured.

The train derailed at Moark, Utah, on the 2d was the westbound "Scenic Limited" and two sleeping cars were overturned. The train was running at about 45 miles an hour, but the cars were of steel and no passengers were seriously injured, though 14 passengers and one waiter were considerably shaken. The derailment was due to malice, an anglebar being thrown under the train. The miscreant was caught and has confessed.

The train derailed at Church Hill, Pa., on the 3d was northbound express No. 63, and the engine was ditched. The train was running at full speed and four passenger cars went off the rails, but remained upright. The engineman and the fireman were killed and five passengers were slightly injured. The derailment, occurring at 1 a. m., was caused by a landslide due to a cloudburst. At stations two miles north and five miles south, the shower was not unusually heavy. August 3 was the date of the flood disaster at Erie.

The train derailed at Pottomoi, Va., on the 4th was eastbound passenger No. 46, and the engine and baggage car were overturned. The train, running about 40 miles an hour, was thrown off the track at a misplaced switch, but no person was seriously injured. The switch had been maliciously misset by a negro boy, who subsequently was arrested.

The train derailed at Swords Creek, Va., on the 5th was freight No. 86, and the locomotive was overturned. Several freight cars fell down a bank into a river. The engineman and fireman were killed and three other train men were slightly injured. The cause of the derailment was not determined, but it is believed to have been due to an obstruction on the track.

The train derailed at Olyphant, Pa., on the 5th was a switching freight and the engine was overturned. The engineman was killed. The derailment was due to insecure roadbed, made soft by heavy rains.

The train derailed on the Pennsylvania at Elders, Ind., on the night of the 9th was an eastbound express passenger, and the engine and one baggage car were overturned. The engineman and fireman were killed and four passengers were injured. The derailment was caused by an open switch, misplaced, evidently, with malicious intent.

The train derailed at Titusville, Pa., on the 12th was southbound passenger No. 66, and the engineman, fireman and 25 passengers were injured. The engine was thrown off the track at a facing point switch at a mill and demolished a freight car and a part of the building. The dining-car was ditched. The engine room of the mill was wrecked and the building took fire, but the city fire department soon extinguished the flames.

The train which was derailed on the Coal River Railway, a branch of the Chesapeake & Ohio, at McCorkle, W. Va., on the 17th, was passenger No. 214 and the baggage car and smoking car were crushed. Four passengers were killed and eight others injured. The derailment was due to a broken rail; but the chief damage was caused by a fall of rocks from the roof of a tunnel through which the train was passing. The derailed cars knocked down the props supporting the roof. The Public Service Commission of West Virginia confirmed a report, made by E. E. Winters, the commission's inspector, holding the railroad company negligent in not laying guard rails through the tunnel. Guard rails, he says, would have guided the wheels of the derailed cars so that the timber lining of the tunnel would not have been knocked down. The inspector also recommended a better system of daily inspection of tracks.

The train derailed at Halleck, Nev., on the 19th was westbound passenger No. 1 and 25 passengers were injured, all but three of the injuries being slight. The train was running about 48 miles an hour and four cars were overturned. The cause of the derailment was not determined, but was believed to be a breakage in the forward truck of the baggage car.

The train derailed near Quanah, Tex., on the 20th was northbound passenger No. 3 and two passengers cars were overturned. Eight passengers were injured.

The train derailed at Swainsboro, Ga., on the 21st was northbound passenger No. 12 and the engine, tender and two cars were overturned. One passenger, who was leaning out of a window, was killed and six passengers and two employees were slightly injured. The cause of the derailment was a low spot in the track, due to heavy rain. The train was running at about 25 miles an hour, and the tender was the first vehicle to leave the rails. Most of the damage was due to the derailed truck striking the guard timbers on a bridge.

The train derailed at Date Creek, Ariz., on the 27th was a northbound passenger. Three passengers and one employee were killed and 17 persons were injured. The cause of the derailment was the weakening of a bridge by a flood, which was due to a cloudburst. The engine and first two cars fell through to the stream below.

The train derailed at Tibbee, Miss., on the 30th was a southbound freight and six cars were wrecked. One brakeman was killed. An officer of the road advises that the cause of the derailment was not ascertained.

The train derailed near Rush Hill, Mo., on the afternoon of the 30th was eastbound passenger No. 16, and 21 passengers were slightly injured. Only two cars left the rails. The tender was the first vehicle to run off; but what was the trouble with it has not been determined.

Traveling Engineers' Association Convention

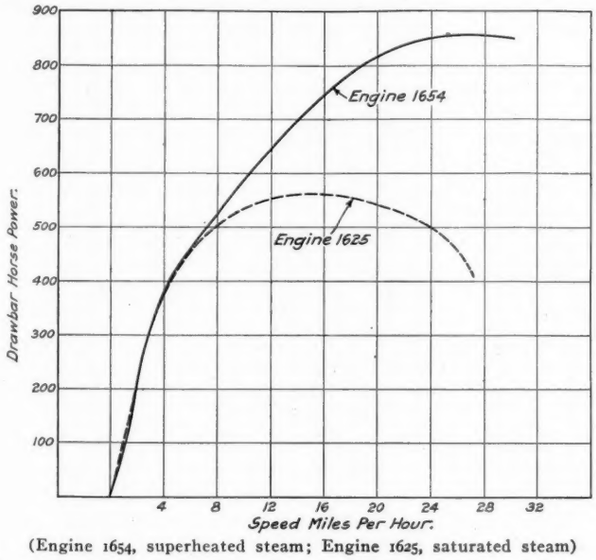
Continuation of the Proceedings Covering Papers on Tonnage Rating, Locomotive Appliances and Valve Gears

An account of the opening sessions of the twenty-third annual convention of the Traveling Engineers' Association, including abstracts of the committee reports on Smoke Prevention and Training New Men for Firemen was published in the *Railway Age Gazette* of September 10, page 473. Following is a report of the remainder of the convention:

MODERN APPLIANCES ON LARGE LOCOMOTIVES

Superheaters.—The fire-tube superheater has come to be almost universally considered as an essential part of the locomotive. The economy it affords is recognized, and it is, without doubt, one of the most important factors in the development of the locomotive, in that it has been largely responsible for the large locomotive of to-day. Two important changes that have been introduced since the last report of the committee on superheaters are a modified header design and a continuous pipe or torpedo unit. The construction of the header is such as to prevent the occurrence of stresses due to unequal expansion and contraction, by casting the saturated steam passage-ways free at one end. The continuous pipe unit is made by forging the return bends on the ends of the unit pipes. This unit reduces the restriction to the flow of gases.

The application of the superheater to the small locomotive raised the capacity limit 25 per cent to 30 per cent, and by the



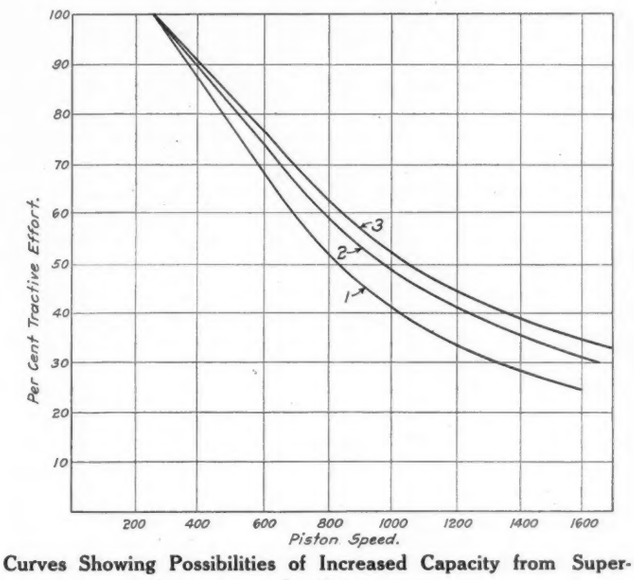
(Engine 1654, superheated steam; Engine 1625, saturated steam)

Average Drawbar Horsepower Developed by Superheated and Saturated Steam Locomotives at Different Speeds

adoption of the superheater, larger engines, greater train lengths and faster schedules have been made possible.

The superheater under actual operating conditions saves 20 per cent of the total fuel burned and from 30 per cent to 35 per cent of the water used over the saturated locomotives developing the same horsepower. The superheater locomotive may be worked at longer cut-offs and at higher speeds, making possible longer trains and faster schedules than is possible with identical saturated locomotives, under the same conditions. The comparative curves shown give the average draw-bar horsepower developed at corresponding speeds of two Class H-21 locomotives on the Erie Railroad—engine 1625 used saturated steam and engine 1654 superheated. These curves show one of the advantages of superheating a locomotive, whose ability to haul full tonnage train over a railroad on a faster schedule, is limited by the capacity of the engine boiler to furnish steam to the cylinders.

Tests made on the Central of Georgia with a superheater and a saturated steam locomotive in passenger service under practically the same conditions showed that for the superheater locomotive the cost of fuel per hundred miles run was $5.01, as against $5.89 for the saturated steam engine. On a basis of the fuel used per 1,000-ton miles the performance of the saturated steam locomotive was only 80.28 per cent as good as the superheater locomotive. The Grand Trunk has applied superheaters to a good many saturated steam locomotives and the benefit derived as



Curves Showing Possibilities of Increased Capacity from Superheating

shown by tests has been so much in favor of the superheater locomotive that the management has decided to superheat all road engines as they pass through the general shops. The following is a comparative result of tests with two simple Consolidation locomotives, one (623) having been converted to a superheater:

	Engine 825 Simple Consol. Saturated Steam.	Engine 623 Simple Consol. Superheat Steam.	Increase or Decrease of Superheated as compared with Saturat'd Locomotive. (per cent.)
Average number of cars in train...	51.88	38.	26.07 D.
Total gross wt. of train in tons....	2,065.18	2,153.07	4.02 I.
Average weight per loaded car.....	39.62	57.79	45.08 I.
Total train miles.....	125.19	125.	.15 D.
Total car miles.....	6,497.	4,759.	26.07 D.
Total ton miles.....	258,964.	269,559.	4.09 I.
Coal consumed in pounds.....	21,307.	13,400.	31.01 D.
Coal cons'd in lbs. per train mile...	170.12	106.75	37.02 D.
Coal cons'd in lbs. per car mile....	3.27	2.95	9.08 D.
Coal cons'd in lbs. per ton mile....	.084	.050	30.04 D.
Total water evaporated in lbs.....	137,614.	98,213.	28.06 D.
Water evaporated per lb. of coal...	6.51	7.36	13.00 I.
Average boiler pressure.....	200.04	173.65	13.03 D.
Average speed in mile per hour....	22.31	26.00	16.05 I.
Miles run with one ton of coal....	11.82	18.76	58.07 I.
Actual running time.....	5 H. 30 M.	4 H. 49 M.	12.04 D.

The application of the superheater to the locomotive boiler, frequently inadequate as to heating surface, necessitates a reduction of about 15 per cent or 20 per cent in the tube heating surface. Notwithstanding this fact the use of superheaters has resulted in greater locomotive capacity. As an illustration of this fact, the accompanying diagram is presented. It shows cylinder tractive effort in per cent plotted against piston speed. The low-

est curve, No. 1, very fairly represents the speed factor for an average saturated steam locomotive. Curve No. 2 similarly represents the average modern superheated steam locomotive, using between 200 and 250 deg. of superheat. The greater tractive effort available is due to the fact that a longer cut-off is possible with the superheater engine than with saturated steam at the same speeds.

If the superheater designer were permitted to use a size of tube different from the two present standards, it is possible to obtain in a superheater boiler an evaporating surface practically as great as in the saturated steam boiler. With a boiler and superheater thus arranged, a greater capacity may reasonably be expected, and a curve approximately that shown as No. 3 may be confidently looked forward to in the near future. This curve is representative of locomotives using 350 to 400 deg. of superheat.

There have been several pyrometers put in service on superheater locomotives during the past year, and as the engineers become more familiar with the purpose and operation of the pyrometer, they realize more and more its importance. Those of the electrical type have been in service and operating continuously for a sufficient length of time to establish the fact that they may be depended upon in locomotive service. When the pyrometer fails to read 600 and 650 deg. when the engine is working steam, it is an indication to the engineer that he is not handling the locomotive so that the maximum saving which the superheater makes available is being obtained.

Grates.—Judging from the number of replies received there are a large number of different designs of grates, varying in air space from 25 per cent to 50 per cent of total grate area. The committee is not in a position at the present time to recommend any particular design, but special attention should be given to the amount of air opening in the grates, giving them as large a per cent of the total area as possible (40 per cent being a fair average).

Mechanical grate shakers are a decided advantage on heavy power and engines with large grate areas. They are of great assistance to the fireman in keeping the fire clean and in getting sufficient air through the grates, thus insuring thorough burning of the coal and gases. This can be accomplished without any excessive physical exertion. This device probably effects the greatest saving at the ash-pit when fires are being cleaned or dumped, as locomotives which were consuming 35 to 40 minutes from ash-pit to roundhouse are now consuming 10 to 20 minutes, and it only takes two men to handle the engine on the ash-pit, where it formerly took four with the hand shaker—a reduction of 50 per cent in labor.

Drifting Valves.—The committee believes that some means should be provided to admit a sufficient amount of steam to cylinders and valve chambers, not only on superheat locomotives, but on any locomotive having cylinders of a large diameter. This will not only prevent carbonization, but will cause the engine to drift much more smoothly. The rods will require less keying up and the maintenance of wedges and journal bearings will be easier and piston heads and cylinders will not wear as fast.

Brick Arches.—Several years ago the brick arch was looked upon and spoken of only as a fuel-saving device, but the constantly increasing demand for greater capacity has resulted in changing its recognized function from a fuel saver to a capacity increaser. The arch increases the boiler capacity directly by aiding combustion and by reducing the heat losses. Naturally this results in increasing boiler efficiency. The arch tubes which support the brick, add valuable heating surface and increase the circulation of water through the boiler. The brick arch separates the fuel bed from the tubes and forms a sort of combustion chamber in what would otherwise be a straight firebox. The efficiency of the arch increases as the rate of combustion or the amount of coal burned per square foot of grate area per hour increases. When burning 30 lb. of coal per hour per square foot grate area, we may expect an efficiency of 3 per cent; when burning 100 lb. per hour per square foot of grate area, we may expect an efficiency of 10 per cent., etc.

Tests indicate that at a rate of combustion of 100 lb. of coal per square foot of grate area per hour, the arch will effect a reduction of 42 per cent in spark losses. This would mean an increase in boiler efficiency of 7 per cent, due to this one item. Reports from many roads indicate a smoke reduction of 50 per cent can be obtained by the use of the arch, and on most roads the brick arch, together with proper firing instructions, have proved sufficient to overcome objectionable smoke and to keep within the law.

Flange Oilers.—Ever since locomotives have been in use, the wear on the wheel flanges has been one of the, if not the greatest, sources of annoyance and expense in maintaining these powerful machines in service. The modern locomotive and high speed demanded has increased instead of decreased it. A very conservative estimate of the loss to one engine for one turning of tires on account of flange wear is $219. The following is an estimate of the mileage a locomotive will make between turning of tires for flange wear, with and without a flange oiler:

Freight		Passenger	
Miles Without Oiler	Miles With Oiler	Miles Without Oiler	Miles With Oiler
9,000 to 12,000	25,000 to 42,000	15,000 to 25,000	60,000 to 84,000

The rapid wear of the rails can be eliminated to a certain extent by the use of a flange oiler which positively delivers a jet of asphaltum oil against the flanges of the locomotive driving wheels. On one division of the Erie the rail saving on curves is 66 per cent. On the Delaware, Lackawanna & Western the saving on the rails on curves has warranted the equipping of locomotives with the flange oiler. While saving the rails on curves, the saving on the locomotive driving wheel tires on this road has been over 50 per cent. Positive proof is given by a number of roads that the flange oiler does prevent derailments.

It has been the impression that any crude oil would do to use with any system of flange oiling. Service tests have proven that results cannot be obtained unless the oil contains from 40 per cent to 60 per cent of asphaltum in solution and is low in grease and paraffine. All oils that are low in asphaltum and high in grease and paraffine will run down on the tread of the driving wheel, causing slipping and tending to defeat the purpose of the device.

Mechanical Stokers.—In answer to questions submitted to the membership, the following replies were received: The stoker engines burn more coal, but as the grade of coal stoker fired is usually inferior to the coal used for hand firing, this feature should not be criticised too severely. With the same quality of coal there is very little difference. The hopper sometimes becomes clogged, causing stoker engine to stop in wet and freezing weather, but this depends largely on the watchfulness of the fireman. When the stoker fails, it usually causes an engine failure, due to the light fire carried and the grade of coal used, making it impossible for a man to pick up the shovel and get the fire in condition without an engine failure, except in cases where the stoker is being worked very light.

In summing up, the advantages of the mechanical stoker are many. It is applied to heavy freight locomotives primarily to work the locomotive to its full capacity, regardless of the conditions under which it is operated, which, of course, means increased tonnage or increased average speed of freight trains under conditions where the tonnage is fixed—in other words, to increase the ton miles per hour over a division. Locomotives equipped with mechanical stokers carry a much lighter fire, which, of course, gives better combustion. A more uniform firebox temperature is obtained, and correspondingly less flue and fire-box trouble. With the scatter system of firing a locomotive the smoke density will remain more unform with the stoker-fired locomotive. The application of mechanical stokers to locomotives has made it possible for any fireman to handle any locomotive, regardless of the manner in which it is worked. By the use of the mechanical stoker the fireman is able to follow his engine more regularly, makes correspondingly more money, and, as a result, is better satisfied, a condition which makes it less difficult to keep a locomotive in service, especially on a division where the conditions of firing are particularly severe and the

overtime runs high, due to the relief of firemen in the hot summer months.

On a number of roads a cheap grade of fuel is purchased especially for stoker-fired locomotives, and on other lines where conditions are such that small run-of-mine coal is supplied, an economy is effected in that the run-of-mine coal is screened and the poor coal is set aside for stoker-fired locomotives, leaving a much better grade of fuel for the hand-fired locomotives.

The following is a list of number of stokers in active operation, of different types:

Street	593	Gee	1
Crawford	301	Ayres	1
Standard	28	Kincaid	1
Hanna	18		

Power Reverse Gear.—Judging from the replies received, the power reverse gear is the ideal gear and is a decided advantage in freight and switching service and will soon pay for installation, due to time saved in making up trains and switching. In some cases the power reverse gear has not given the results expected of it in fast passenger service, principally owing to the neglect of certain small but important items of maintenance. The use of the screw reverse gear is advocated by many roads for fast passenger service owing to the possibility of very fine adjustment, but its principal drawback is its slowness in reversing, making it difficult to take slack.

Coal Passer.—It has been the experience of the chairman of the committee on the railroad with which he is connected, that locomotive tenders equipped with coal passers are a valuable asset to modern power. This device places the coal within easy reach of the fireman and eliminates the furnishing of men at different points to shovel the coal ahead. It also allows the doubling of divisions without taking coal, thereby reducing the amount of coal which has to be handled to the farthest terminal. The cost of maintenance of the coal passer has been found to be very low.

Automatic Fire Door.—The butterfly type of the automatic fire door is generally preferred to either the horizontal or vertical types. It is the smoothest working door, gives the least trouble on the road, and requires less repairs at terminals. By the use of this type of door, single-shovel firing is accomplished, which prevents a large amount of cold air from entering the fire-box and materially reduces the amount of fuel required to keep up steam pressure.

The report is signed by J. E. Ingling (Erie), chairman; P. J. Miller (N. Y. C. West.); H. F. Henson (N. & W.); W. A. Buckbee (Loco. Sup. Co.), and A. G. Kinyon (S. A. L.).

DISCUSSION

Representatives from the Erie favored highly the use of pyrometers on superheater locomotives, calling attention to the fact that a loss of 20 deg. of superheat will affect the evaporation of water one pound per indicated horsepower. The pyrometer also serves to give the fireman a much closer check on the condition of the fire and shows the engineer whether or not he is getting the most out of the engine.

The graphite lubricator has been found by several roads to materially increase the life of the piston packing rings. Tests on the Delaware, Lackawanna & Western demonstrated that by its use the valve leakage was reduced 51 per cent.

The question of using superheater or perfection valve oil received considerable attention. In almost every case the superheater oil was believed to be unsatisfactory in the air compressors, some roads providing separate lubricators with perfection oil to serve these attachments, while other roads use perfection oil for both the compressors and the cylinders. A. G. Kinyon contended that if it were possible to eliminate the air from the cylinders while the engine is drifting better results can be obtained with perfection oil than with the superheater oil, inasmuch as in the manufacture of superheater oil with its higher flash point its lubricating qualities are affected. Some roads, in an endeavor to prevent air getting into the cylinders, have eliminated relief valves and substituted drifting valves with material success.

SCIENTIFIC TRAIN LOADING; TONNAGE RATING

By O. S. Beyer, Jr.
Chicago, Rock Island & Pacific

Scientific train loading or tonnage rating takes into consideration, as far as may possibly be determined, every element affecting the economical movement of freight trains. These elements may be summarized as follows: Drawbar pull of locomotive; resistance of freight cars of all weights; grades; curves; condition of track; temperature, weather and wind; opposing traffic; length of division, and speed.

The object of a scientific tonnage rating system primarily is to give an engine the same amount of work to do regardless of whether a train is made up of heavy cars or light cars, or a mixture of them. Its further object is to load engines at all times in accordance with conditions of weather, temperature, wind, track, etc., so that freight will always be handled for the least expense possible per ton-mile.

The most scientific and simple system yet devised is the adjusted tonnage rating system. This system, when carried out to its logical conclusion, as its name implies, endeavors to adjust the loads of freight trains as exactly as possible to suit the conditions existing. In order to understand how the adjusted tonnage rating system accomplishes this object, its development for a division and application will be described.

The first element to be considered is the drawbar capacity of the locomotive used in hauling freight trains over the division, in conjunction, of course, with the grades and curves of the division and the desired speed of the train over the division. The sustained drawbar pull of an engine equals the sustained theoretical tractive effort of the engine less the effort of the engine lost to move itself and tender. The sustained theoretical tractive effort of the locomotive at a speed above 7 to 10 m.p.h. depends on the speed of the pistons at these higher speeds and the capacity of the boiler to furnish steam. This tractive effort, for a saturated or a superheated steam locomotive, is secured by the aid of the figures shown in Table I—first by calculating the piston speed of an engine in feet per minute at the speed at which the engine is to run over the ruling grade and then referring to Table I to determine what speed factor corresponds to the piston speed calculated. The product of the maximum theoretical tractive effort when multiplied by the speed factor will be the sustained tractive effort of the engine at the speed considered.

TABLE I

Speed Factors for Saturated Superheated Steam Locomotives at Various Piston Speeds

Piston Speeds Ft. per Min.	Speed Factor Saturated	Superheated
100	1.000	1.000
200	1.000	1.000
300	.954	.954
400	.863	.863
500	.772	.772
600	.680	.682
700	.590	.605
800	.517	.542
900	.460	.490
1,000	.412	445
1,100	.372	.405
1,200	.337	.371
1,300	.307	.342
1,400	.283	.318
1,500	.261	.297

Next, it is necessary to make allowance for the power lost by the engine moving itself. This depends principally upon the weight of the engine in tons. The power lost by the engine lifting itself up grade is equal to twenty times the total weight of the engine in tons times the grade in per cent. The power lost by the engine moving itself, i. e., rolling its own wheels on the rails, may be divided into three subdivisions:

Resistance of drivers in pounds—
22.2 lb. times weight on drivers in tons.
Resistance of trucks in pounds—
6 lb. times weight on trucks.
Resistance of tender in pounds—
Resistance per ton of tender (see Table II) times weight of tender in tons.

If the locomotive is obliged to traverse a curve, then a further deduction of one pound per ton of locomotive per degree of curve should be made. Inasmuch as very high speeds do not enter into the consideration, it is not necessary to make allow-

ance for air resistance to the locomotive in determining its sustainable drawbar pull.

All those various resistances, namely, that due to grade, drivers, engine trucks, tender, and curvature, are then added together and subtracted from the sustained tractive effort which the engine is capable of maintaining at the speed at which it is to negotiate the ruling grade. Mathematically the foregoing statement may be expressed in the following formula:

$$\text{S. D. B.} = \frac{.8\ F\ P\ d^2\ S}{D} - W_G\ (20g + 1\ C) - 22.2\ W_D - 6\ W_T - r$$

in which S. D. B. represents sustainable drawbar pull of engine in lbs.

F — Speed factor of engine running at speed under consideration as determined from Table I.
P —Maximum boiler pressure of engine in lbs. per sq. in.
d — Diameter of engine cylinders in inches.
S — Stroke of engine cylinders in inches.
D — Diameter of engine drivers in inches.
W_G — Total weight of engine and tender, fully loaded, in tons.
g — Per cent of grade.
W_D — Weight in tons of engine on drivers.
W_T — Weight in tons of engine on trucks.
T — Weight of tender in tons, fully loaded.
r — Resistance in pounds per ton of engine tender considered as a car (determined from Table II).
C — Degree of curvature.

RESISTANCE OF TRAIN.

Having found the drawbar pull the engine will sustain negotiating the ruling grade, it next becomes necessary to determine the weight of train this amount of drawbar pull will move up the grade at the speed desired. The resistance of a freight train depends directly on weight of the train, average weight of cars composing train, grade, curvature, speed at which train is required to move up grade, temperature, and wind.

Train resistance may be classified, generally speaking, under two heads: Internal resistance and external resistance.

The internal resistance of a freight train is that resistance which arises principally from the friction of the car journals in their bearings, the rolling of the car wheels on the rails, the friction of the car wheel flanges on the rails, friction at side bearings and center bearings, etc.

The external resistance of a freight train is that which arises from sources outside of the train itself and is principally composed of the resistance due to grade, wind and curvature.

Internal Resistance of Freight Trains.—The internal resistance of a freight train, or, more simply speaking, of a freight car, does not vary directly in proportion to the weight of the car in tons. For this reason an engine can haul more tonnage in heavily loaded cars than in light or empty cars. And so in loading freight trains, the adjusted tonnage rating system recognizes this feature and makes it possible to load each engine with tonnage according to the number of light or heavy or both kinds of cars composing the train. By referring to Table II it will be noted exactly how the internal resistance varies per ton of cars weighing 15 to 75 tons for different speeds.

TABLE II
Value of Internal Resistance in Pounds per Ton Gross Weight of Freight Cars of Various Weights at Different Speeds

Weight of cars in tons	Pounds of Resistance per Ton of Car at Speed of 5 m. p. h.	10 m. p. h.	15 m. p. h.	20 m. p. h
15	7.62	8.19	8.82	9.56
20	6.77	7.29	7.88	8.53
25	6.02	5.50	7.01	7.60
30	5.38	5.80	6.28	6.82
35	4.82	5.20	5.64	6.11
40	4.39	4.69	5.06	5.50
45	4.01	4.28	4.60	5.00
50	3.72	3.96	4.24	4.60
55	3.49	3.69	3.94	4.27
60	3.30	3.49	3.73	4.04
65	3.16	3.34	3.57	3.88
70	3.05	3.24	3.48	3.79
75	3.00	3.18	3.41	3.71

The temperature of the atmosphere and the condition of the track affect this internal resistance. As the temperature decreases or when the condition of the track is poor, the internal resistance is greater. Consequently, when determining the proper tonnage for an engine, these facts must be taken into consideration largely according to judgment. The figures given in Table II have been determined by a long series of tests at summer temperature on track which was in very good shape. Hence these figures should be used when determining the maximum train loads possible under ideal conditions.

External Resistance of Freight Trains.—The external resistance of freight trains or cars arises, as pointed out previously, from grade, curvature and wind. The grade resistance of freight cars is the same as that of locomotives, equaling per ton of car 20 times the per cent of grade. Curve resistance also is determined the same as curve resistance for locomotives. For purposes of tonnage rating under average conditions, an allowance of one pound resistance per ton of car for each degree of curvature has been found very nearly correct.

Wind resistance to freight cars is a variable quantity under usual railway operating conditions. Its effect is best determined as a matter of judgment in the use of the various classes of ratings established (to be described later) according to the actual conditions existing. For instance, on a windy day it would not be policy to rate trains as heavy as on a calm day.

External resistance is not affected by weather or temperature and does not vary practically except in direct proportion to the weight of the train. The length of the train, i. e., the number of cars, has a little to do with curve resistance and wind resistance, but this influence on the whole resistance is too remote to be determined accurately.

The total resistance of a freight train per ton of car weight, as explained in the foregoing, may be summarized and expressed by the following formula:

$$R = v_c + 20\,g + 1\,C.$$

in which R represents total resistance in pounds per ton of freight car, v represents internal or rolling resistance per ton of freight car, depending upon weight of freight car, as determined from Table II at speed under consideration; g represents grade, expressed in per cent and C represents degree of curvature.

DETERMINATION OF TRAIN WEIGHTS

The weight of train in tons which may be moved at a certain speed over a certain grade and curve is found by dividing the sustainable drawbar pull in pounds of the engine by the total resistance per ton of car. Mathematically expressed, this statement takes the following form:

$$\text{Weight of Train in Tons} = \frac{\frac{.8\ F\ P\ d^2 S}{D} - W_G\ (20\ g + 1\ C) - 22.2\ W_D - 6\ W_T - r_c\ T}{V_c + 20\ g + 1\ C}$$

In order to demonstrate just how the hauling capacity of a locomotive varies according to the different weight cars making up the train, the following example will be of interest. The conditions assumed are:

Consolidation locomotive.....40,000 lb. maximum tractive effort
Grade .....0.3 per cent
Average weight of light cars.....20 tons
Average weight of heavy cars.....70 tons
Speed of train up grade.....10 m. p. h

The sustainable drawbar pull of the engine at 10 m.p.h. on straight and level track, as determined by the method described, is 35,300 lb. Deducting for grade resistance on a 0.3 per cent grade, this sustainable drawbar pull becomes 34,220 lb.

The resistances per ton of a 20-ton and a 70-ton car at 10 m.p.h. going up a 0.3 per cent grade are as follows:

For a 20-ton car—
Internal resistance (see Table II)..... 7.29 lb.
Grade resistance (.3% × 20)..... 6.00 lb.
Total resistance .....13.29 lb.

For a 70-ton car—
Internal resistance ..... 3.24 lb.
Grade resistance (.3% × 20)..... 6.00 lb.
Total resistance ..... 9.24 lb.

Consequently the tonnages and number of cars which, under most ideal conditions this 40,000-lb. tractive power Consolidation locomotive can pull over a 0.3 per cent grade at 10 m.p.h. in

20-ton cars (all lights or empties) and in 70-ton cars (all heavies or loads) are respectively:

In 20-ton cars, i. e., lights or empties—

Weight of train..... $\frac{34,220}{13.29} = 2,575$ tons.

Number of cars..... $\frac{2,575}{20} = 129$ cars.

In 70-ton cars, i. e., heavies or loads—

Weight of train..... $\frac{34,220}{9.24} = 3,706$ tons.

Number of cars..... $\frac{3,706}{70} = 53$ cars.

Thus it is seen that on a 0.3 per cent grade a 40,000-lb. tractive power locomotive can pull 1,131 more tons in trains consisting of 70-ton cars than it can pull in trains consisting of 20-ton cars. When this fact is fully appreciated, the advantage of adjusting the tonnage of trains according to the average weight of all the cars making up the train is completely realized.

The more steep the grade becomes the less the difference in tonnages between the light car trains and heavy car trains. This is accounted for by the fact that as the grade increases the grade resistance, which is constant per ton for all cars, heavy or light, becomes a greater proportion of the total resistance and the rolling or internal resistance, which varies per ton inversely as the weight of the car varies, becomes less in proportion to the total resistance. This is another important fact and should be fully grasped so that it will be clearly understood why the adjustment for difference in car weights becomes less and less as the ruling grade increases.

CAR FACTOR METHOD OF TONNAGE ADJUSTMENT

Having determined, as far as possible, the hauling capacity of a locomotive or class of locomotives over a division, after taking into consideration mathematically all the items which affect the problem, namely, train speed, grade, theoretical drawbar pull of engine, average car weights, curvature, etc., the final problem remains to find the best method of making up trains in the yard so that their tonnage will be equalized or adjusted to suit the hauling capacity of the locomotive, everything considered. It is felt that the best method by which this end is reached is the car factor method of tonnage adjustment.

This method simply provides for the addition of a purely imaginary figure, known as the car factor, to the actual weight of each car, including the caboose, entering into the make-up of a train until the sum of all the actual car weights plus their car factors equals the adjusted tonnage rating over the division of the locomotive to be loaded or rated. Knowing what actual tonnages and how many cars an engine or class of engines may pull over the grades of a division both in light or empty cars and in heavy or loaded cars, as determined mathematically by the process previously explained, it becomes a very simple matter to establish the car factor and the adjusted tonnage rating for the engine and division under consideration. The car factor equals the difference in the tonnages of the heaviest car train and the lightest car train the engine can haul, divided by the difference in the number of cars between the heaviest and lightest car trains. The adjusted tonnage for the engine equals the sum of the actual tonnage of the lightest car train and the number of cars in this train multiplied by the car factor, or, which is the same thing, the sum of actual tonnage of the heaviest car train and the number of cars in this train multiplied by the car factor. To illustrate, take the figures of tonnages and number of cars determined as the hauling capacity of a 40,000-lb. tractive effort Consolidation locomotive on a 0.3 per cent grade:

Weight of 70-ton car train.....3,706 tons.
Weight of 20-ton car train.....2,575 tons.
Difference in tonnages.....1,131 tons.
Number of cars, 20-ton car train..... 129
Number of cars, 70-ton car train..... 53
Difference in number of cars..... 76

Hence car factor on 0.3 per cent grade..... $\frac{1,131}{76} = 15$

And so the adjusted tonnage for 40,000-lb. tractive effort engine under ideal conditions on 0.3 per cent grade, engine moving at 10 m.p.h., equals:

$2,575 + (129 \times 15)$.....4,510 adjusted tons.

Or, which is practically the same thing:

$3,706 + (53 \times 15)$.....4,501 adjusted tons.

This same theoretical analysis applies to any condition of grades and size of locomotive involved. If carried out for all grades varying from 0 to 2 per cent the car factors applying to each grade will be found as per Table III:

TABLE III
Car Factor for Different Grades

Grades in Per Cent	Car Factor
0.0	70
.1	31
.2	20
.3	15
.4	12
.5	10
.6	8
.7	7
.8	6.5
.9	5.5
1.0	5
1.25	4
1.50	3.5
1.75	3.0
2.00	2.8

Thus it is seen that the heavier the grade becomes, the less the car factor grows, while, of course, at the same time the less the adjusted tonnage rating becomes.

The significant fact to be gained from the method of tonnage adjustment is that the actual weight of trains varies indirectly in proportion to the number of cars composing the train, and directly in accordance with the average weight of all cars composing the train. This is more graphically illustrated by Table IV, which is based on the figures developed for the adjusted

TABLE IV
How Train Tonnage Varies for Different Average Car Weights Considering a 40,000-lb. T. P. Locomotive on a 0.3% Grade; Adjusted Tonnage, 4,500; Car Factor, 15

Average Car Weights in Tons	Actual Weight of Train in Tons	Number of Cars Composing Train
20	2,565	129
30	3,000	100
40	3,270	82
50	3,465	69
60	3,600	60
70	3,705	53

tonnage rating of a 40,000-lb. tractive power Consolidation locomotive on a 0.3 per cent grade.

REDUCTIONS FOR WEATHER AND OTHER CONDITIONS

Having determined theoretically and verified practically by previous locomotive performance records, special tonnage tests and dynamometer car runs, if possible, the maximum adjusted tonnage which can be hauled over a division, it finally becomes necessary to establish certain reduced ratings to guard against weather and other conditions which make reduced ratings necessary. It has been found most practical to provide four ratings for each class of engine between principal yard points or division terminals. These four ratings may best be designated by the letters *A, B, C* and *D;* the *A* rating being the maximum and the *B, C* and *D* ratings reductions from the maximum or *A* rating according to certain percentages dependent on the ruling grades encountered.

Inasmuch as the temperature has the greatest influence on the resistance of trains and hence the hauling capacity of locomotives, this is used as the basis on which to reduce the tonnage of trains from the maximum rating. Primarily a reduction in temperature only affects the internal resistance of trains, increasing it as the temperature drops. Consequently, the greater the proportion of internal resistance of a train, the greater is the effect of a reduction in temperature on the resistance of the train. In other words, the lower the ruling grade, the greater the proportional allowance must be from the maximum or *A* rating for a reduction in temperature.

What the exact allowance is that should be made for certain reductions in temperature under all conditions has never been proven exactly by experiment, and in reality hardly can be proven very accurately. Experience, however, determined in the light of reason, has shown the following temperature variations to be

satisfactory upon which to base reductions in tonnage from the maximum when making up trains:

Maximum rating—Temperature above 40 deg. F.
First reduction—Temperature below 40 and above 20 deg.
Second reduction—Temperature below 20 deg. and above zero.
Third reduction—All temperatures below zero.

For purposes of simplicity these various ratings may be designated as *A* or maximum and *B*, *C* and *D* respectively. Table V is given to show what has been found, in practice, to be satisfactory working reductions for temperature changes, based on increasing grades. It should be noted that as the grade increases,

TABLE V

Reductions in Per Cent to be Made From the Maximum or "A" Adjusted Rating for Decreases in Temperature

Grade in Per Cent	Reductions in % from Maximum or "A" Adjusted Ratings			
	Above 40°	40° to 20°	20° to 0°	Below 0°
0.0	0	13.70	27.40	41.10
.1	0	11.20	22.40	33.60
.2	0	9.70	19.40	29.10
.3	0	8.70	17.40	26.10
.4	0	7.98	15.96	23.40
.5	0	7.45	14.90	22.35
.6	0	7.00	14.00	21.00
.7	0	6.70	13.40	20.10
.8	0	6.42	12.84	19.24
.9	0	6.20	12.40	18.60
1.0	0	6.00	12.00	18.00
1.25	0	5.63	11.26	16.89
1.50	0	5.37	10.74	16.11
1.75	0	5.20	10.40	15.60
2.00	0	5.00	10.00	15.00

the amount of reductions from the heaviest rating grows less and less. The reason for this has been pointed out before and is sound logic, borne out by experience.

PRACTICAL CONSIDERATIONS IN DETERMINING MAXIMUM ADJUSTED TONNAGE RATING

Inasmuch as the maximum or *A* adjusted tonnage rating for an engine is the rating from which all the others are determined —that is, forms the basis for the ratings over a division—it is quite essential that this be established as nearly accurate as possible. It will most always be found, however, that the highest rating which is considered possible by mathematical calculation is either too high (most usually too high) or too low for practical purposes. Consequently, after the theoretical determinations have been made, they should always be fully tested out by actual tonnage tests under practical conditions. If the service of a dynamometer car can be had for this purpose it will assist materially toward proving or disproving the accuracy of the calculation.

The element of train speed, necessity to get from terminal to terminal in a certain time to get the greatest number of ton-miles per year out of an engine, is another very important practical consideration. It is difficult to determine generally what the most economical speed is at which trains should move over the division. To establish this speed and demand that it be lived up to at all times is a mistake, for the many conditions on a division which affect it are changing continually. It has been found by experience that the provision of four ratings, *A*, *B*, *C* and *D*, gives the division superintendent or division chief despatcher a sufficient number of ratings from which to choose for each day or each train, if necessary, in order to move the business best to suit the many influences which bear on this problem. And if the ratings are not sufficient, then special ones may quickly be established, according to the judgment of the official in authority, in order to meet special or emergency conditions.

The following brief explanations and instructions have been used with success by the author when he has had occasion to introduce the adjusted tonnage rating system on a railroad. They are repeated here by way of illustration:

The following two important facts and their effect on freight train operating economies will be appreciated from a study of the adjusted tonnage rating system. The first is the benefit resulting from making up trains so as to get as many loaded or heavy cars as possible into each one and thereby avoid running trains composed entirely of empty or light cars. This arrangement will often prevent the running of trains on which tonnage has had to be sacrificed on account of having reached the car limit before the train was filled out to the maximum adjusted tonnage.

The other fact which should be realized is the necessity of getting actual car and thus train weights as accurate as possible. The entire benefit from the adjusted tonnage rating system will be lost unless great care is taken in determining the actual car and train weights. To this end such means and systems at yard offices and at stations where cars originate for shipment should be introduced which will result in the greatest possible accuracy in determining actual car and train weights.

INSTRUCTIONS

(1) All ratings are based on tons.

(2) To determine the proper tonnage for an engine, find first from the rating tables the adjusted tonnage in effect corresponding to the engine. Then add the car factor to the actual weight in tons of each car. Finally, add together the weights of all cars plus their car factor allowance until the total equals the adjusted rating in effect.

(3) To determine the proper tonnage for a pusher, double header, or three or more engine train, add together the adjusted ratings in effect for each one of the engines in question and proceed as outlined in paragraph 2.

(4) When rating an engine, yardmasters and conductors will consider the caboose as one of the cars of the train, adding the car factor to the actual weight in tons of the caboose and this to the adjusted tonnage of the balance of the train, the total to equal the adjusted rating in effect, exactly as outlined in paragraph 2.

(5) When dead engines are hauled in a train yardmasters and conductors will add four times the car factor to the actual weight of each dead engine, and this to the adjusted tonnage of the balance of the train, the total to equal the adjusted rating in effect, as outlined in paragraph 2.

(6) Yardmasters and conductors will add another light car to the train when the total adjusted tonnage of the train, including the caboose, adds up fifteen or more adjusted tons (that is a fraction of a car) less than the adjusted rating in effect.

(7) Despatchers, yardmasters and conductors will place as many loaded or heavy cars as possible in every train and avoid running any trains consisting entirely of empty cars unless otherwise instructed.

(8) All classified freight trains as well as ordinary freight trains will be rated strictly on the adjusted tonnage basis.

(9) No reductions in tonnage on account of weather or other conditions are to be made unless authorized by the superintendent.

(10) Actual weights of empty or loaded cars must not be estimated or assumed when they are available from the car stencils or the way-bills.

(11) When actual weights cannot be determined, the following estimates for weight of contents and lights weights of cars are to be used, but not otherwise. Contents are to be estimated at the marked capacity of the car, except in case of light commodities, such as hay, cotton or bran, in which case the contents should be estimated at one-half the marked capacity. In the case of way freight (merchandise) cars, five tons will be used as the weight of the contents.

Light weights of cars to be estimated as follows:

Kind and Capacity of Cars	Light Weight (in Tons)
Box 40 ft., 80,000 lb. capacity	19
Box 34 ft. and 36 ft., 60,000 lb. capacity	16
Box 34 ft., 40,000 lb. capacity	13
Box 25 ft., 40,000 lb. capacity	10
Furniture 40 ft.	18
Furniture 50 ft.	21
Refrigerator	18
Refrigerator (meat)	21
Stock 30 ft., 30,000 lb. capacity	10
Stock 36 ft., 40,000 lb. capacity	11
Stock 36 ft., 60,000 lb. capacity	16
Double deck stock	16
Plain flat 30 ft.	8
Plain flat 34 ft.	12
Plain flat 40 ft.	14
Plain flat 43 ft.	17
Coal cars 34 ft.	13
Coal cars 36 ft.	16
Hopper bottom coal, 80,000 lb. capacity	18
Hopper bottom coal, 100,000 lb. capacity	21
Rodger ballast cars	16
Ingoldsby dump cars	18
Tank cars	14
Cabooses	15

(12) When converting the actual weights of cars from pounds

into tons by dividing the actual weights in pounds by 2,000, yardmasters and conductors will in all cases neglect a remainder of 999 pounds or less, but will consider a remainder of 1,000 lb. or more as one ton.

DISCUSSION

J. M. Daly, formerly general superintendent of transportation of the Illinois Central, and an expert on tonnage rating, opened the discussion, speaking very highly of Mr. Beyer's paper. He believed that if in making up trains this system of adjusted tonnage were followed large economies in transportation costs would be made. He called particular attention to the fact that the resistance per ton of the loaded car is much less than that of the empty car. This of itself should justify the use of the adjusted tonnage rating system. He mentioned one road that had made a saving of 5 per cent by adopting this system. The overloading of locomotives was condemned as being more expensive than underloading. A solid and substantial roadbed and track are especially necessary where heavy car loads are handled. Mr. Daly stated that some of the new roads in Canada are establishing terminals at high points of land in order to obtain descending grades in both directions out of the terminal for the purpose of warming up the car and locomotive journals and thus saving fuel.

Several members had found by experience that the short trains with the heavy loads hauled much easier than the long trains of light cars, even though the actual tonnage was much greater. It was generally believed that while a dynamometer car was of considerable advantage in determining the rating of a locomotive the work can be very satisfactorily performed by men experienced in the performance of locomotives.

In helper service it is found to be much better practice to place the assisting locomotive at the rear of the train, especially if the grades are undulating and the curves are sharp. Mention was made by Prof. L. E. Endsley of the increase in train resistance due to badly worn wheel treads and loose trucks, the former being found, by test, to increase the resistance as much as 100 per cent.

ELECTRO-PNEUMATIC BRAKE

Walter V. Turner, assistant manager and chief engineer of the Westinghouse Air Brake Company, gave an illustrated lecture on the possibilities of the electro-pneumatic brake in the steam railway field. He called attention to the relation of the air brake to the power of the present day locomotive, showing how these powerful engines would be useless without the air brake to control them. The variable load brake has made possible to a still greater degree the heavier trains, the Virginian now operating trains of 8,000 tons with this type of brake. When considering the action of the air brake, the rail, the roadbed, the consist of the train and the foundation gear must all be taken into account, as they all have a definite bearing on how the brake will perform in service.

The piston travel is of prime importance, especially on long trains. It should be constant throughout the length of the train if "rough handling" is to be eliminated. Tests have shown that with an 8-lb. brake pipe reduction at the end of two seconds the cars with the proper piston travel (8 in.), will develop a braking power of 16 per cent, whereas those cars with a 6-in. travel of the piston will develop a braking power of 43 per cent, which naturally causes very rough handling of the train.

In speaking of the clasp brake, he gave as a rough and ready rule as to when this brake should be used, the condition where the side pressure of the shoe exceeds the downward pressure of the wheel.

The purpose of the electrically-operated brake is wholly and solely to permit the use of a more efficient air brake. With the electrical control it is possible to have the brakes on all the cars in the train operate simultaneously rather than consecutively, as in the brakes controlled by the reduction of pressure in the train line; because of this feature the surging or the running in of slack, with its attendant disastrous results, will be eliminated and, at the same time, it will be possible to make use of a greater retarding force, thus materially decreasing the length of stop. Experiments have shown that the retarding force can be built up to 20 per cent with the electrically operated brake, whereas the best pneumatic brake will permit of only 8 per cent retarding force—good train operation being obtained in both cases.

At the present time the electro-pneumatic brake is only available for passenger trains with electrical equipment. The amount of current required for the operation of this brake practically prevents its being used on freight cars in long trains.

Mr. Turner showed various diagrammatical illustrations of the electro-pneumatic brake and pointed out the versatility of the entire system. As many and as small applications of the brake can be made as desired, and the entire system can be recharged with the brakes set. The danger of "stuck brakes" is eliminated, the service and quick-action parts being entirely separate from each other. By its use passenger trains hauled by modern locomotives that have taken 18,500 ft. to accelerate to 58 m.p.h. have been stopped in less than 1,000 ft.

VALVE GEAR DESIGN AND LOCOMOTIVE OPERATION

An interesting scientific paper on the effect of properly designed valve gear on locomotive fuel economy and operation was read by W. E. Preston, traveling engineer, Southern Railway, in which the theoretical indicator card was described and analyzed. He also presented formulae for horsepower, tractive effort and for determining the weight of steam used per hour (for constant speed).

In speaking of the relation of the valve gear to the indicator card he described the link motion diagram and the Zeuner diagram. Taking the dimensions of a Consolidation locomotive as a concrete example he showed how the ideal card could be obtained and the theoretical speeds at various points of cut-off. From these were calculated the horsepower at different speeds, and the steam and coal consumption. In speaking of the distorted indicator cards he said in part, as follows:

There are many things that go to distort an indicator card, but a defect in the valve gear, or the setting of the valve gear, will at once become evident in the indicator card.

Figs. 1, 2 and 3 illustrate some of the defects due to faulty valve gear.

P = Wiredrawing.
m = Too much lead.
r = Too early exhaust closure.
s = Too early exhaust opening.
x = Insufficient compression.
n = Not enough lead.
t = Late exhaust.
u = Loose motion and wiredrawing.
P = Lack of lap.
y = Excess back pressure due to late exhaust.
w = Blow.

These are the common defects due to the valve motion. Other defects, such as excess condensation, restricted ports, leaky valves, etc., are shown by the indicator card, but as these are not the fault of the valve motion they have no place here.

The card shown in Fig. 4 was taken from an actual test on a Consolidation engine, having a Stephenson valve gear. It is a corner card, but the cut-off on this engine measured 87.5 per cent, whereas it should have been 85 per cent if properly set. The result of over-travel of the valve is clearly seen in the very late exhaust and lack of lead. From this card it is determined that 14.5 per cent more coal was being used than necessary at this point of cut-off. Moreover, the distorted motion reduces the maximum tractive effort of the engine some 3,000 lb.

Fig. 5 shows another card from the same engine hooked up to the sixth notch. Here the cut-off measured 73 per cent on the engine, while for this notch the ideal card gives 69 per cent. The straight line is the ideal card; the bent line showing the actual card. The valve still lacks lead and has too late exhaust opening, but the back pressure drops to normal at the admission end of the card. The effect of the slack in the valve motion is clearly shown at *a*. After the port gets fully open there seems to be very little throttling effect. This also applies to Fig. 4. Hence the port openings are ample.

The mean effective pressure for the ideal card is 167 lb., while

for the actual card it is 156 lb., the increase in cut-off not being quite enough to compensate for the effect of late admission and exhaust. In this case there is 11.4 per cent more coal being burned than necessary to develop the same horsepower, the tractive effort being reduced 2,800 lb.

As the lead increases as the reverse lever is hooked back toward the center of the quadrant, we would expect the card of Fig. 5 to be better than that of Fig. 4. All of the events being earlier in the stroke, we find that the earlier release somewhat reduces the back pressure.

Theoretically the back pressure line should be parallel to the atmospheric line, and about the same distance from it for all cut-offs. At high speeds and short cut-offs, of course, more exhausts take place per minute than at slow speed, but to offset this we have a very much less volume of steam exhausted per stroke at high speed than at low speed. Practically, it is found that the back pressure increases slightly as the speed increases, the amount of condensation not being exactly constant at all speeds. However, the back pressure should not be greater than

Fig. 1

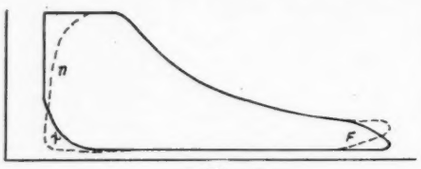


Fig. 2

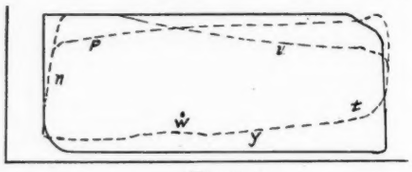


Fig. 3

10 lb. at 20 m.p.h., or 15 lb. at 15 m.p.h., according to the best authorities.

As another example of a very poor card Fig. 6 is shown. This card is a very common one for valves poorly set. The line *ed* shows a lack of lead, the line *dc* shows the wiredrawing and slack motion effect of the valve in opening the steam port, while *cb* shows this effect for the closing of this port or at cut-off. The cut-off and expansion are normal, while *gf* shows a late and

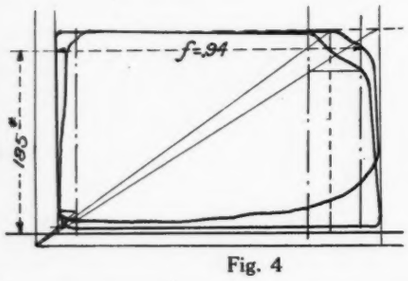


Fig. 4

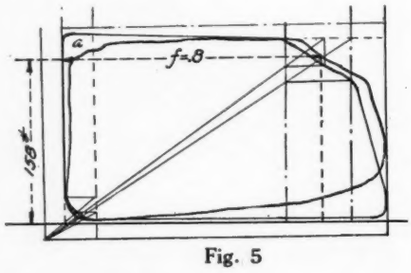


Fig. 5

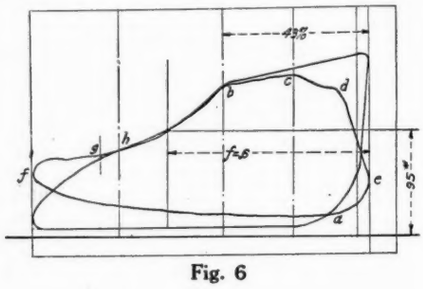


Fig. 6

restricted exhaust, and *fa* shows that the exhaust port does not get fully open until the piston is at *a* on its return stroke—hence the high back pressure and resulting small compression.

As the expansion line for the length *bh* is the same for the good and bad cards, the amount of steam and coal used is, of course, the same for both cards. The coal consumption per horsepower hour, however, is increased 14.5 per cent.

DISCUSSION

While the discussion did not bear particularly on the contents of the paper presented by Mr. Preston as above, a number of interesting points were brought out by the members. It was believed that the Stephenson valve gear would give as good results from the fuel consumption standpoint as any valve gear of the outside type. However, it was stated that with the elimination of the eccentric it was possible to better maintain the outside gear and thus insure a more constant steam distribution.

IMPROVING THE HANDLING OF AIR BRAKES

The air brake instruction car cannot be questioned for its value in detailed study of the air brake system, but the road foreman of engines can perform a great service in giving practical instruction on the road. He can pick out those engineers deficient in this work and give them individual instruction. He is also in a position to advise the shop forces as to what should be done to provide a brake that will give the best and most desirable results.

The road foreman of engines, due to his knowledge of the road, is also in an excellent position to give valuable information to the operating men regarding meeting points, and the location of sidings, signals, water tanks, etc. He also can be of great assistance in educating the enginemen in making proper engine inspections and reports. There is in the engine a tremendous power to damage and destroy equipment, unless it is carefully handled in starting and stopping, and the traveling engineer by his constant and careful instruction can do much to keep the rough handling of trains to a minimum.

The report is signed by C. M. Kidd (N. & W.) chairman; T. F. Lyons (N. Y. C. West); George Kleifgas; J. B. Hurley (Wab.), and C. P. Cass (W. A. B.).

DISCUSSION

Discussion.—It was believed to be the duty of the traveling engineers to see that the equipment was turned over to the enginemen in proper condition for handling and then to see that the trains were properly handled. Several roads have tried with success the posting of damage reports due to rough handling, defective brakes, etc. The engineer must be given a train properly made up, that is, the empty and loaded and also the weaker cars should be so distributed throughout the train as to provide the best possible action of the air brakes. Some members believed that better results would be obtained if the mechanical department controlled the matter of making up the trains.

SUBJECTS

The following subjects were recommended for consideration at the next convention:

What effect does the mechanical placing of fuel in fireboxes and the lubricating of locomotives have on the cost of operation?

The advantages of the use of superheaters, brick arches and other modern appliances on large locomotives, especially those of the Mallet type.

Smoke prevention.

Make up of freight trains for tangents and grades with reference to draft rigging and lading.

Assignment of power with a view of obtaining the most efficient service.

CLOSING EXERCISES

Warren S. Stone, grand chief, Brotherhood of Locomotive Engineers, made a brief address during the session Friday morning. He spoke of the traveling engineer as the intermediary between the engineer and the railway officers. Some roads are getting far better results from their enginemen than others, having obtained their implicit confidence by dealing with the men fairly and honestly. He called upon the traveling engineers to "play the game square" and to be sure and place the blame of an accident where it properly belongs, whether it be on the man, machine, roadbed, or wherever it may be.

Mr. Stone was elected an honorary member of the association.

The attendance was 404 members; the secretary reported a membership of 1,061, and the treasurer reported a cash balance of $7,500. The following officers were elected for the ensuing year: J. R. Scott, president, St. L. & S. F.; B. J. Feeny, first vice-president, Illinois Central; H. F. Henson, second vice-president, N. & W.; W. L. Robinson, third vice-president, B. & O.; G. A. Kell, fourth vice-president, Grand Trunk; A. G. Kinyon, fifth vice-president, S. A. L.; David Meadows, treasurer, M. C., and W. O. Thompson, secretary, N. Y. C.

Chicago received the highest number of votes as the place for holding the next convention.

AMERICAN RAILWAY PERISHABLE FREIGHT ASSOCIATION

The semi-annual meeting of the American Railway Perishable Freight Association was held at the Great Northern Hotel, Chicago, on September 8. Over 100,000 miles of line were represented at the meeting.

The executive committee reported that it has continued active correspondence with traffic associations regarding the necessity and desirability of inserting in all tariffs reasonably uniform rules requiring shippers of perishable freight in carloads to give complete and definite instructions as to whether or not shipments are to be transported under refrigeration, icing, non-icing, ventilation or other authorized accessorial service, and that recommendations substantially to the same effect were made by the Freight Claims Association at its recent annual meeting. The question of securing greater uniformity of tariff rules regarding perishable freight and the possible publication of some joint issue to cover the same is being investigated by the committee, but further time is required. The committee also recommended that all member lines be requested to arrange with their respective law, traffic, operating and freight claim departments whereby they will furnish to the secretary of the association copies of all briefs, arguments and other forms of documents relating to claims, suits, cases or public hearings involving perishable freight service matters, to the end that the association files may not only be kept complete, but that results accomplished by carriers dealing with such matters in one section of the country may become a benefit and of direct practical use to carriers in other sections of the country. This plan would contemplate that the facilities of the association so far as practicable would be at the command of all member lines when they desire special information.

The report of the committee was adopted by the association.

The rules committee reported that it had been unable to proceed with the complete revision of association circular 27-C, containing standard service rules, because some of the important subjects are still under consideration by interested traffic associations, and the committee asked further time for the revision with a view to the revised rules being compiled and put into type before January 1, if possible, for submission to all members of the association. The committee also recommended that the association bring to the attention of all traffic associations the desirability of inserting in tariffs the complete legal definition of perishable freight. The committee also recommended that the association consider the printing of an illustrated poster to illustrate clearly but briefly the proper methods of icing and reicing cars, also tamping ice. Regarding a proposed rule that carriers make notations on billing of perishable freight to show date and hour of each previous reicing, the committee reaffirmed its previous recommendation that the association take no decided position on the question other than to state that if certain roads do consider the plan feasible and practicable it sees no objection to its adoption by such individual roads. The report was adopted.

The service committee reported that it has, in addition to its other work, given consideration to the analysis of various claims for alleged loss or damage to perishable freight which have been presented by member lines to the committee for that purpose and suitable replies have been made to interested carriers. The committee is continuing its investigation of the theory of using ice in the winter to prevent freezing to fruits and vegetables and other perishable goods in transit, and has received some additional information, but requested that further time be granted by the association. The committee believes it will be desirable for the association to consider the question of carriers' non-liability for loss and damage by freezing carload shipments of fruits and vegetables or other perishable goods in transit, when the shipper has not only failed to install false floors to break the frost line or to provide other protection, but has also omitted to request the carriers to furnish any protective service. The report of the committee was adopted.

Other subjects discussed at the meeting were: The present status of carriers' rules and practices covering heated car service by shippers and carriers; the use of ice in packages in the body of cars; damage to deciduous and citrus fruit due to sampling in transit; rules to govern ventilation of cars interchanged with Canadian railroads.

The officers of the American Railway Perishable Freight Association are: Chairman, J. S. Leeds, manager, Santa Fe Refrigerator Despatch, Chicago, Ill., and secretary, E. F. McPike, perishable freight service manager, Illinois Central, Chicago, Ill.

PERFORMANCE OF PENNSYLVANIA ELECTRIC LOCOMOTIVES

Electric locomotives have now been in use for about four and one-half years on the Manhattan division of the Pennsylvania Railroad, operating passenger trains through the tunnels entering New York city under the Hudson river. These locomotives* were designed to start and accelerate a train of 550 tons, in addition to the locomotive, on a 1.93 per cent grade in the tunnels. In actual operation trains of 850 tons are frequently started on this grade and 14 all-steel car trains, weighing over 1,000 tons, are handled without difficulty.

Each locomotive in service passes over an inspection pit once every 24 hours for a running inspection of the machinery, slight repairs being made where necessary. This inspection requires an average time of about ten minutes. After a locomotive has made 3,000 miles, it is taken into the shop for a general or periodic inspection, when all electrical apparatus is thoroughly inspected, tested, cleaned and the necessary adjustments and renewals made to all electrical and mechanical parts.

The shopping for general repairs is governed by tire wear, and a number of locomotives have run from 90,000 to 112,000 miles before it became necessary to turn the tires or do other general repair work. The general overhauling is handled in one of the regular steam locomotive repair shops.

In November, 1914, 33 electric locomotives had completed four years' service, and during that period had made the following mileage and detention record:

Locomotive miles	3,974,746
Total engine failures	45
Total minutes detention to trains	271
Locomotive miles per detention	88,328
Locomotive miles per minute detention	14,667

During this period 463,558 train movements were made, thus giving an average of about 1,300 movements per detention

The change from steam to electric locomotives and *vice versa*, is made at Manhattan Transfer, four minutes being allowed by schedule for this operation, including the necessary testing of the air brakes. The entire operation, however, may be performed in three minutes and is said to have been done in two minutes.

MILITARY CONTROL OF RUMANIAN RAILWAYS.—Rumanian railways are said to have been ordered to place all rolling stock at the disposal of the war ministry by September 14.

*For a complete description of these locomotives see *Railway Age Gazette*, November 5, 1909, page 881.

NATIONAL INDUSTRIAL TRAFFIC LEAGUE

At the meeting of the National Industrial Traffic League held in Toledo, Ohio, on September 9 and 10, the following resolutions were adopted regarding the railway mail pay controversy:

Whereas, There is a controversy existing between the common carriers of our country and the postoffice department over the compensation due said carriers for transporting the mails, and

Whereas, In various rate advance cases the carriers have insisted that their total net income is insufficient, and their claim has been an important factor in such cases, and

Whereas, If the carriers' compensation for transporting the mails be not adequate, the burden necessarily falls upon the shipping public to make up the deficiency through higher freight and passenger rates, and

Whereas, The honor and dignity of our government demand that said controversy be brought to a speedy conclusion, therefore be it

Resolved, That it is the sense of the National Industrial Traffic League that the fact should be speedily ascertained as to whether our common carriers are receiving adequate compensation, and be it further

Resolved, That our president be instructed to memorialize the proper committees of the senate and house of representatives suggesting that the Interstate Commerce Commission is the proper body to assist in ascertaining the facts and that it be directed to investigate the entire question and report as speedily as possible its findings and recommendations for the guidance of congress in bringing said controversy to a prompt and proper conclusion.

The report of the executive committee discussed a plan for establishing league headquarters at Washington, D. C., but this subject was put over until the next meeting.

In connection with the report of the legislative committee there was a discussion of the subject of codification of the interstate commerce law as to mutual rights of shippers and carriers, and it was decided to co-operate with the American Bar Association in its tentative codification and its movement to have congress take up the subject. On the right of appeal from negative orders of the Interstate Commerce Commission the committee reported that while the shippers ought to have the same right in this respect as the carriers, a change in the law might work to their disadvantage, and it was decided to have the committee study the subject further and recommend some suggestions for a revision of the law without interfering with its present provisions in other respects.

The proposed reorganizaton of the Interstate Commerce Commission was discussed but no action was taken. The subject of legislation as to uniform classification was discussed but no change was made in the previous position of the league, that the initiative should rest with the carriers and that there should be no legislation on this subject. A resolution was adopted urging an amendment of the Cummins law as to limitation of liability by common carriers to eliminate express and baggage from its application. A resolution was also adopted urging an amendment to the fourth section of the commerce act so that through rates may not exceed the combination of lawful rates, even though one factor is a state rate which has not been enjoined or set aside by competent authority.

In connection with the report of the tariffs committee, the subject of consolidation of individual tariffs in Official Classification territory into association issues, which had been proposed at the last meeting, was discussed and the subject was dropped for the reason that it was believed that no economy would result. The subject of disposition of fractions in the establishment of freight rates will be given further consideration by the committee, which reported that the Interstate Commerce Commission is inclined to look with favor on a plan for stating rates with no smaller fraction than ½ cent, if the carriers and shippers can agree.

In connection with the report of the freight claims committee, the subject of handling of freight, packing, marking, etc., was discussed and the committee was instructed to begin work on a manual of instruction on this subject to be placed in the hands of shipping clerks.

The subject of duplicate charges on prepaid shipments was discussed, and the league complimented the action of the American Association of Railway Accounting Officers and the American Railway Association on their recommendations for the extension of through interline billing as one means of preventing duplicate charges.

In connection with the report of the bill of lading committee, the league went on record in favor of a "clean" bill of lading, to constitute a plain receipt of freight without the various contract provisions now included in the bill of lading, which it was believed are now not required since the enactment of the Cummins law. It was stated that the export millers will file a complaint with the Interstate Commerce Commission against the export bill of lading and the league also authorized the filing of a complaint on behalf of all lines of business.

A resolution submitted by the weighing committee was adopted, stating that tariffs have been filed with the Interstate Commerce Commission which do not conform to the code of rules regarding weighing agreed to by the league and the American Railway Association and approved by the Interstate Commerce Commission. The weighing committee was instructed to continue conferences with the American Railway Association, or if necessary to ask the Interstate Commerce Commission to reopen the weighing case for final settlement. This referred to a rule of the Central Freight Association lines providing for a charge for light-weighing empty cars.

Edward E. Clark, of the Interstate Commerce Commission, addressed the league at a dinner on Thursday evening at the Toledo Club. Commissioner Clark's address is published elsewhere in this issue.

OUTLOOK FOR COAL CAR SUPPLY FOR COMING SEASON

BY ARTHUR HALE

The surplus of coal and gondola cars reported by the American Railway Association for September 1, 1915, was nearly 41,000. This is not far from last year's figures for September 1, (46,000), but the shortage of coal cars this year is over 2,300, while last year it was only 66.

There was no large surplus of coal and gondola cars prior to 1914 until we get back to 1909. There we find on August 18 a surplus of about 42,000.

In 1908 the surpluses were much larger until the middle of October.

It is, of course, difficult to judge from those figures what the situation in coal cars will be in October and November, but in 1909 there was quite a marked shortage of coal cars, which ran up to nearly 12,000 in the middle of November.

There is one point in which the record this year is similar to that of 1909; that is, the surplus decreased very rapidly in August, while in 1914 it came down very slowly. This would seem to point to the possibility of some little coal car shortage in the months of October and November of this year.

On the other hand, the drop this year seems to be about two weeks later than it was in 1909. Here again it is difficult to compare, because this year we have figures only for the first of the months, while in 1908 we had them for the middle of the months as well.

About all that can be said in the matter is that if we can judge this year's showing by that of 1909 there will be a shortage of perhaps 8,000 or even 10,000 coal cars on November 1.

Maintenance of Way Section

The Maintenance of Way Section for October will be delayed one week to enable a complete report of the convention of the American Railway Bridge & Building Association, which will be held in Detroit from October 19 to 21, inclusive, to be included. This section will, therefore, appear in the issue of October 22, rather than in the regular third issue of the month.

The Proper Care of Ties

The economy of tie preservation and the importance of conserving the timber supply have been emphasized so frequently that they are generally realized. But in discussing such subjects in the abstract, or in large figures for the country as a whole, one is not impressed with their significance so strongly as by more definite statements, such as those made by F. J. Angier, in an article in another column in this issue, in which he shows that the amount expended for ties on the Baltimore & Ohio constitutes the largest single item of material cost with the exception of fuel, and that this expense amounted to $250 per mile of track maintained in 1913, an increase of 109 per cent in ten years. Entirely aside from the significance of this rapid increase, the actual amount expended is of special significance as an illustration of the importance of careful supervision in the use of this material. The handling of ties is entrusted almost entirely to the track foremen. It is important that as full life as is consistent with safety be secured from all ties. To accomplish this the foreman must be instructed carefully regarding the limits of service and be made to realize the value of the material he is handling. In spite of the attention which has been given this subject in the past, there is still room for improvement, which is made all the more necessary by the continual increase in this item of expenditure.

The Increasing Use of Motor Cars

One of the first railway divisions in this country to be equipped throughout with motor cars was the Illinois division of the Chicago, Milwaukee & St. Paul between Chicago and Savanna. Motor cars entirely superseded handcars on this line in 1909 and the results which have been secured from their continued operation, as well as the methods adopted for their care, described in another column, are of special interest. One reason for their success here has been that the roadmaster has made himself at all times conversant with the motor cars, and therefore able to instruct the men regarding their operation. This has not always been done by roadmasters, as is illustrated by the fact that an Italian section foreman on a Western road recently received a motor car direct from the shops, crated, without any instructions for setting it up or running it. It is not surprising that this car proved a failure. Thorough instruction of the men is necessary in handling any new device, and a road owes it to itself to see that any new equipment for which it expends its money be used so as to secure the most favorable results. The motor car is no longer regarded as experimental. It has proved its economy to such a point that many roads are making it standard in place of the handcar. One large road is equipping one-third of the sections on each division with motor cars each year for three years. Another busy double-track Eastern road, with very dense traffic, has discontinued the use of handcars entirely and is using motor cars on all its lines, finding that even on the heavy traffic lines the number of cars hit has been reduced owing to the care exercised by the foremen.

An Object Lesson in Economy

One of the most serious obstacles to the economical management of a large corporation such as a railroad is the lack of direct financial interest on the part of minor officers. As a rule these men are truly conscientious and have the interests of the company at heart, but many of them are prone to criticise because the company fails to supply equipment and material, which to them seems indispensable to the attainment of certain economies in operation and maintenance. They overlook entirely the interest and depreciation charges which the additional investments involve and which might very largely neutralize the savings which they expected to make. One of the Eastern railroads has adopted a practice which will tend to overcome this tendency on the part of track foremen. Each foreman is supplied with a price-list covering all equipment used by the track forces, with instructions to enter the cost of each item on all his requisitions for supplies. This serves as an object lesson in several ways. It calls frequent attention to the number of section gangs on the road, thereby enabling the foreman by only the simplest mental calculation to obtain a definite idea of what it will cost the company to supply one additional tool to each section. An appreciation of the money value of the equipment with which he is supplied will give the foreman a greater sense of responsibility for the contents of the tool house. He will guard against losses and be quicker to note improper and careless use of the tools. Taken together, there is no more faithful class of employees on the railroads to-day than the section foremen, and they offer, therefore, a fertile field for demonstrations as to the best ways in which the company's interests may be served.

THE ROADMASTERS' CONVENTION

THE convention of the Roadmasters' Association, held in Chicago last week, was the most successful in the history of this organization. While the attendance did not exceed that of last year, the reports and especially the discussions were of a higher grade than in previous years. After a long period of difficulties this association has made rapid strides during the past three or four years, so that it is now taking an important place among the maintenance of way associations and deserves the support of the railways.

Few railway associations have more important fields than this, and there is no conflict between it and the American Railway Engineering Association, as each has a sufficient number of problems coming within the special province of its members to occupy its entire time. The Roadmasters' Association should include division engineers and others directly in charge of maintenance of way work and confronted with it in its details as well as the roadmasters not now identified with it. The association confines its activities strictly to problems connected with the maintenance of track. From its very nature the American Railway Engineering Association can devote only a small amount of attention to these subjects, for it must also consider problems of design and those of interest to the bridge engineer, engineer of water service, construction engineer and other branches of the engineering department.

The membership of the Roadmasters' Association is at present confined almost exclusively to roadmasters and track supervisors. It is to the mutual interest of this organization and of the engineers that more engineers interested in maintenance problems become affiliated with this association. In this way it can be strengthened materially and its activities broadened and it can become of more real service to the railroads.

THE SELECTION OF CONCRETE MATERIALS

CONCRETE has become so thoroughly established as a construction material that its application to various uses does not call for the amount of discussion of its merits that characterized the earlier years of its development. It is true that investigations are being carried on with no less zeal, and even along much more systematic lines than formerly, and the cement industry is performing a commendable service in giving publicity to the latest developments. Still, these matters do not excite the attention that was given to concrete in its infancy. In other words, we have reached the point where we are taking things for granted as we do in regard to long-established practices in the use of lumber. Because of this there is a possibility that we are overlooking considerations of great importance in the use of concrete in much the same way that, as has been shown, the details of our use of lumber have long been faulty.

In all classes of concrete work scrupulous care is exercised to insure a good quality of cement, attainment of this object being aided by the general acceptance of well known standard specifications and the simple and tangible character of the tests and their results. On the other hand, there seems to be a general impression that almost any kind of sand or larger aggregate is good enough. Specifications for sand to the effect that it shall be clean and sharp, backed up by a casual glance by way of inspection, are ordinarily considered all that is necessary to secure a good quality of concrete, provided the cement has passed rigid tests. More careful consideration is usually given to the stone or gravel, but even in these a far greater variation in the quality of the materials is permitted than would be allowed for cement.

The influence of variations in the characteristics of sands and gravels upon the strength of mortar and concrete has been generally appreciated by students of this subject. In general, it may be said that the effects of variations in the size and grading of particles and the influences of the presence of loam, clay and vegetable matter, are fairly well understood by the users of concrete. But these things seem to be lost sight of when it comes to the selection of the materials for actual use. All too frequently we see a structure of excellent design and workmanship marred by evidence of the use of dirty aggregate, or one which suffers from porosity because of a failure to study proportions.

The importance of these considerations has recently been emphasized by C. C. Wiley, in Bulletin No. 70 of the Illinois Experiment Station, entitled, "Mortar Making Qualities of Illinois Sand." The extensive tests recorded in this paper demonstrate clearly the need of a careful selection of the sand. It points to the importance of the mineralogical composition as indicating the strength and durability of the particles and demonstrates the futility of specifying a sharp sand. Tests of a large number of samples of commercial sand indicated a variation in the strength of mortar briquettes of 300 per cent.

Construction work on a certain railroad in the Middle West was carried on at one time with gravel and sand, hauled an average distance of 300 miles, when subsequent investigation disclosed a superior material on the company's lines less than 50 miles from the work. This state of affairs would not have existed if proper study had been made of all the materials tributary to the construction district.

The use of sand cement in certain sections of this country directs attention to another phase of the economics of concrete. Sand or silica cement is a mechanical mixture of Portland cement with a pure, clean sand, very finely ground together in a tube mill or similar machine. For the best grade of Portland cement, the proportions of cement to sand are 1:1, although as lean a mixture as 1:6 has been made to compete with natural cement.

In standard Portland cement 80 per cent must pass a 200-mesh sieve and probably not more than 40 per cent of the particles of cement are chemically active. On the other hand, a blend of Portland cement and sand has shown from 90 to 95 per cent passing a 200-mesh sieve. Because of this extremely fine grinding it is probable that much more than 40 per cent of the particles in the original standard cement will be chemically active. If standard Portland cement could be so ground that 90 to 95 per cent would pass through a 200-mesh sieve, a barrel should make as much concrete as two barrels of blended cement, the ultimate strength of the concrete being the same in both cases. A sand cement should make a concrete equal in every way to that made from standard cement, no matter where used.

In the southwestern part of the United States there is a zone about 500 miles wide, extending from the center of the state of Texas through New Mexico and Arizona, and then turning to the north through the center of Nevada into Oregon, in all a total length of 1,400 miles, in which no cement is manufactured. The price of cement, at the mills, tributary to this district, except such as would come from the Kansas, Oklahoma and Texas districts, is materially higher than in the rest of the country. In 1914 the average price in the Rocky Mountain district, as given by the report of the Department of the Interior, was 40 per cent higher than in the entire country. Taking this into consideration, together with the great length of the haul to most points in the district, it would seem that the use of the sand cement would be a matter for serious consideration.

COMPARATIVE PUMPING COSTS

AN article in this issue discusses the necessity for the use of a unit adequately expressing power in any comparison of pumping costs. Special attention is directed to the error of reporting these costs in units expressing only the amount of water delivered. That the futility of such a report of pumping is readily appreciated by many who have no definite understanding of the principles of hydraulics, is evidenced by the fact that reports in terms of water pumped are frequently supplemented by statements of the difference in the elevation of the water at the source and at the point of delivery, ignoring entirely, however, the friction head which may constitute the major portion of the pumping resistance. On the other hand, the office man may set out to determine the static and friction head and calculate the cost of pumping in terms of gallons pumped against a one-foot head, perhaps reducing this finally to horsepower. This gives, without question, the best comparison of pumps that can be made without actual observation of the water horsepower, but it may be widely in error because of the opportunity for discrepancies between the assumed friction factor and the actual resistance of the pipe lines. Old pipes are rough and may be clogged with scale and sediment, the actual arrangement and size of the pipes may be different from those given in the record, and there may be other conditions, concerning which the office man has no knowledge that will seriously affect his results. The conditions outlined point to the need of a more thorough supervision of water service matters, combining practical experience with a thorough knowlegde of hydraulics and allied subjects. Such a supervision will not only make for the correct determination of pumping costs, but will tend to secure better results in all phases of water service. The consumption of water at a given station may be increased threefold, yet the water is still pumped through a long pipe line, once adequate, but now entirely too small, necessitating excessive velocity and consequently a wasteful friction. Cases have been discovered where the saving in pumping in one year would pay for a new pipe line of proper size. A long neglected check of the displacement of the pump against the actual volume delivered at the tank may disclose a discrepancy which the condition of the pump valves will not permit of explanation as slip, with the result that a leak of years standing is discovered. Many other examples could be given showing the economies to be obtained by a proper attention to this important department.

The Roadmasters' Thirty-third Annual Convention

An Abstract of the Committee Reports and Discussions Presented at the Meeting Held Last Week in Chicago

The thirty-third annual convention of the Roadmasters' and Maintenance of Way Association of America was held at the Auditorium Hotel, Chicago, September 7-10, inclusive. About 200 members were in attendance. The convention was one of the most successful in the history of the association, particularly in point of interest displayed in the committee reports and in the character of the discussions. The exhibits of the Track Supply Association were also up to the usual standard.

The convention was called to order by President P. J. McAndrews (C. & N. W.) at 10:30 Tuesday morning. The association was welcomed to Chicago by Harry E. Miller, city prosecuting attorney; by W. J. Towne, assistant general manager, Chicago & North Western, and by F. A. Preston, vice-president of the Track Supply Association. In his remarks Mr. Towne particularly emphasized the increased responsibility of the roadmaster in recent years and the growing importance of developing economical methods of working, stating that it is becoming absolutely necessary to make every dollar go as far as possible, consistent with safety. Past Presidents T. Hickey (M. C.), A. E. Hansen (A. T. & S. F.), James Sweeney (C. & E. I.), T. Thompson (A. T. & S. F.), A. M. Clough (N. Y. C.), and W. Shea (C. M. & St. P.), also spoke concerning the various phases of the work of the association. In his opening address President P. J. McAndrews reviewed the activities of the association in the past year and commented upon its future.

The officers of the association for the past year were: President, P. J. McAndrews, roadmaster, Chicago & North Western, Belle Plaine, Ia.; first vice-president, Colman King, supervisor, Long Island, Jamaica, N. Y.; second vice-president, M. Burke, roadmaster, Chicago, Milwaukee & St. Paul, Chicago; secretary-treasurer, L. C. Ryan, roadmaster, Chicago & North Western, Sterling, Ill. The report of the secretary-treasurer showed that 120 new members had been received during the past year and that there is a balance of $685 in the treasury.

THE PROPER ORGANIZATION OF SECTION FORCES AND METHODS FOR MAINTAINING AND POLICING TRACK

FOR HIGH SPEED HEAVY TRAFFIC ROADS

General Makeup of Track

Width of Subgrade.—Single track, 21 ft.; two tracks, 33 ft.

Drainage.—All cuts in clay soil or in a mixture of clay and sand should be tiled on one or both sides of the track, depending on the amount of moisture encountered. On multiple tracks in wet districts a line of tile should be placed between each set of two tracks. All tile should be laid below frost line on a level to permit proper drainage and should be covered by some porous material. The size should be governed by the amount of moisture. Surface ditches should be a standard distance from rails. In deep cuts, where the surface slopes toward the track, ditches of sufficient depth should be made on top of the cut at least 40 ft. from the track to prevent flood waters running on to the tracks and from washing down the slopes of the cut.

Ballast.—The best ballast available should be used. We recommend crusher run stone ballast of hard limestone, with a maximum size of 2 in. and a minimum size of ½ in., free from clay and dust when received from the crusher. Ballast should be placed to a depth of not less than 8 in. under the ties, and dressed even with the top of the ties in the center, with a slight slope to about 2 in. below the tops of the ties at the ends and sloping 1½ to 1 from a point 6 in. outside the ends of the ties to the base of the ballast line.

Rail.—The best quality of rail of not less than 100 lb. to the yard should be used. Rail in this class of track should at all times be in an almost perfect condition. It should not be left in track for any length of time after it becomes battered or curve worn to any extent, as in this condition it is nearly impossible to maintain good riding track, and, if left in too long, may cause accidents.

Joints.—Joints should be of substantial plain type, with no portion protruding below the base of rail. Oil-treated steel is preferred.

Bolts.—One-inch oil-treated bolts are specified.

Frogs.—No. 12 frogs are desired for slow-speed crossovers and passing-track movements, and No. 20 frog for high-speed crossovers operated by interlocking.

Track Ties.—Ties 7 in. by 9 in. by 8 ft. 6 in. shall be placed in the track so there will be 4 in. more outside of the outer rails on double track than outside of the inner rails. For single track ties should be laid so they will extend equally outside of each rail except on curves in excess of 2 deg., where they should be placed so that 4 in. more is on the outside of the low rail than outside of the high rail. Twenty ties should be used per 33 ft. rail-length, making slightly more than 11 in. spacing between each. White oak is recommended and we believe it economical to use tie plates on each tie, such tie plates to be of the anti-creeping type.

Tie Plates.—Shoulder tie plates should be not less than ⅝ in. thick.

Anti-Creepers.—Enough should be used to hold the rails from creeping of a type easy to apply, simple in construction and that stay on.

Switch Ties.—Use 7 in. by 9 in. of various lengths of hardwood.

Make-up of Passing Tracks.—Main passing tracks should be provided with a fair quality of ties and rail of a section approximating main-track rail. It is often found economical to use the lighter sections taken from main tracks when they are being relayed with a heavier rail. The ties in passing tracks and important side tracks should never be of such inferior quality as to require labor being expended unnecessarily in frequent renewals or an element of danger to employees by derailment being involved.

Work Equipment Recommended to be Available, Possibly to be Used on More than One Sub-division

Steam ditchers, power-rail loaders and unloaders, center-dump ballast cars, a few air-dump ballast cars to use with a steam ditcher, a clam shell, ballast spreaders, ballast shapers of the most modern type, for widening and shaping the subshoulder and ballast shoulder, rail-laying machines, power subshoulder weed-mowers, snowplows and flanger cars.

The above power-driven machinery and labor-saving devices have been recommended because we think them necessary to offset the constant deterioration in quality of available track laborers. All labor-saving machinery should be given careful consideration and made use of where possible. The saving that may be made by the use of bank-widening, ballast-shaping, rail-loading, rail-laying, weed-mowing and other machinery is so apparent that we are at a loss to understand the tardiness of some railway managements in their general adoption of this practice.

Weed-killing by the application of chemicals has been proven a great labor and money-saving process. The use of air-driven rail saws and drills should be gone into and advantage taken of them as a means to attain efficiency.

A Roadmaster's or Supervisor's Subdivision Organization, the Length of Subdivision and the Length of Section

Roadmaster or supervisor—1
Length of division—100 miles of double track or its equivalent
Assistants—2
Chief Clerk—1
General Timekeepr—1
General Material Clerk—1
Foremen—34
Length of section—3 miles of double track or its equivalent
One extra foreman and from 8 to 20 laborers
One assistant foreman and track-walker combined for each section, to be paid 25 cents a day more than laborers
Blacksmith—1
Carpenters—2
Section men—1½ man per single-track mile in season when ballast can be worked and ties put in—1 man per mile in seasons when ballast cannot be worked or ties put in in climates where rail renewals can be made and fences can be rebuilt and repaired.

We recommend this subdivision organization on subdivisions of 100 miles in length because more supervision of the right kind is necessary to secure the maximum results in safety and efficiency.

Only a small percentage of the foremen are quick to discover and put into practice simpler and easier methods for bringing about required results. It is amazing to observe the various methods of performing each particular operation by different foremen on one division and especially to note the variation in costs for the same kind of work.

We recommend a clerk for every roadmaster or supervisor because the duties he can perform will enable the head of the subdvision to spend more of his time where he is needed, *on the road,* where he can do the most good. A general timekeeper is needed on divisions where the roadmaster or supervisor handles the time of his men. He should in no way relieve the foreman or road timekeeper from keeping the time of his men, but rather should keep a check on them, insuring correct timekeeping and proper charges being made to various operations.

A general material clerk should in no way relieve foremen from the responsibility of caring and accounting for all material under their charge, but should keep a correct record of all material handled on divisions where used, where stored, etc. He should do this by constant checking on the ground on the various sections.

We recommend a subdivision floating-gang foreman and crew of varying size, composed of picked men whose compensation should be slightly more than the regular section men. This gang should be equipped with a portable camp and tools for various track work. This crew should be employed to do various special jobs, such as building new side tracks, transferring cars, handling snow and various other jobs. At times when special work is slack it should assist some foreman in doing heavy work and give assistance to the foreman who is behind in his work.

The above section forces should be employed the year around because the practice of reducing forces to the minimum in the early fall does not appear to be the best. With certain limitations a force more nearly uniform throughout the year is most economical, for a better grade of laborers will enter and remain in service and be satisfied with a lesser wage if assured of work all the year round. In a climate that will permit, such work as relaying rail, gaging track and rebuilding fences can be done in the late fall and early spring and much other miscellaneous necessary work can be carried on throughout the entire winter. *There is much less work to be done during the summer than in cases where the force is reduced below a reasonable number early in the fall,* and consequently a less number of men may accomplish the season's work, thus greatly reducing the necessity for large extra gangs and so-called floating gangs during the summer months, if not altogether eliminating them.

We recommend a blacksmith on each subdivision to repair tools, make light repairs to section cars, etc., because such a man, working under the direction of the roadmaster, will more nearly secure the full life out of each tool, as he will be getting suggestions from the men who use them. We recommend two carpenters to relieve the section men from doing many tinkering jobs such as repairing planked crossings, wing fences, bunk cars, etc.

Recommended Methods for Doing Heavy Work

Ballasting work should be started as early in the spring as track conditions will permit and closed up early enough in the fall to permit the section men to get over the new stone, leaving it in first-class condition for winter. Old material should be removed to the bottom of the ties and spread out for widening embankments, leaving the subgrade in a rounding shape. All ditches should be cleaned and embankments strengthened where necessary in advance of ballasting operation.

All necessary tie renewals should be made and ties properly spaced. Track should then be lifted to the proper grade, making the first lift to the top of the grade stakes and only tamping by filling under the ties at the ends and under the full width of the rail, using round-pointed shovels or spades for this work. After the track has been given at least a few days' settling under traffic, a second and final lift should be made and the track tamped carefully with diamond-pointed tamping bars or tamping picks from the outside ends of the ties to a point fully inside of the rail base. Center-dump ballast cars and center-ballast spreaders are recommended for handling the new ballast.

From reports coming under our observation we believe slot spiking at joints or the spacing of ties immediately under the joints is unnecessary and constitutes a waste of labor. Uniform spacing of ties and anchoring of the track by the use of anchor tie plates or anti-creepers is more economical from every standpoint. However, if some railways insist on spacing ties to conform to the angle bar slots, rail laid during the winter months, if properly anchored by anti-creepers, can wait until the condition of roadbed will permit tie spacing with no detrimental results to rail or surface.

The committee recommends that as much rail as possible be laid in the early fall, winter and early spring.

In making renewals of rail the basic principles of this work should never be sacrificed to the sometimes too insistent demand of railway managements for fast work. In other words, rail should be laid from the practical rather than from the theoretical standpoint. To lay rail right, the work must be done so that the new rails have proper bearing on each tie. This means in most cases a careful adzing of all the ties. Proper expansion is the other essential of good rail laying, while the items of careful application of joint material, immediate and continued tightening of bolts, the proper driving of spikes, immediate anchoring to prevent creeping and destruction of uniform expansion and replacing of the ties for uniform support under each rail, are so important that the neglect of any means waste.

Sufficient supervision should be provided to insure competent men overseeing all features of the work. The number of men in one rail laying gang is a factor that should be considered carefully, bearing in mind that large gangs with insufficient supervision or small gangs with frequent waste of time walking back and forth, are elements of loss that should be considered and kept to the minimum.

Handling Material

On each division of 100 miles a small, well arranged and well equipped material yard should be maintained, and if possible equipped with air or other power to operate a drill, rail saw and crane for handling rail, ties and other heavy material.

If ties for annual renewal are received in the fall and winter preceding their use, they should be distributed along the track where needed and piled in small neat piles with an aim to keep

the maximum distance of truckage from pile to place of installation, below 66 ft. Where this cannot be done, they should be piled in a material yard and distributed where needed when ready to install.

As a general rule rail is rolled only a short time preceding its installation, but if it is not to be used within a reasonable time after being received, it should be stored in a yard rather than distributed along the track. Switch ties, fence posts, crossing plank and fence lumber should be sorted and stored in a yard and only distributed as required for immediate use.

Scrap, as well as usable materials, should be cleaned up regularly and assembled until disposition is given.

At a designated time, say, once every two months or oftener, the roadmaster or his assistant should attach sufficient suitable cars to the way freight if he has no regular work train and gather up all scrap, usable rails partly scrap (accumulated by repairs), defective rails and in fact everything but a minimum allowance of emergency material such as rails on rest, a few angle bars, spike, bolts, etc., leaving anything of course that will be used immediately.

Renewal of Track Ties

This work should be commenced as early in the season as roadbed conditions will permit and continued with as few interruptions as possible until the season's requirements are all in. When track is being re-surfaced ties can be renewed at the least cost. To keep stone ballasted track in the best possible riding condition it should be surfaced out of face at least once every three years. Therefore, we recommend that, in so far as possible, tie renewals be made only in such portions of the track as are surfaced out of face each year. The matter of inspecting and indicating the ties that should come out of main track, the manner of applying new ones and the number furnished, are items of importance and should be given a great deal of attention by supervising officers.

L. C. RYAN (C. & N. W.) Acting Chairman.

DISCUSSION

In discussing the width of subgrade the committee replied to a question that it had in mind 13 ft. between track centers in placing the width of subgrade on double track at 33 ft. After attention had been called to the fact that the laws in some states require a minimum distance between track centers on new construction of 14 ft., the report was amended to provide that the minimum width of subgrade should be 21 ft. for single track and 20 ft. greater than the distance between track centers for double track.

In discussing drainage, J. O'Connor (M. St. P. & S. S. M.), opposed laying tile lower than 4 ft. below the bottom of the surface ditch even in cold climates, as he had found that running water does not freeze in these drains. It is his practice to use 8 in. bell tile and to backfill the ditch to the top with cinders or coarse gravel. With this construction he reported no difficulty with heaving. W. Shea (C. M. & St. P.), described a recent examination of a number of drains in northern Missouri. These drains have been laid 4 ft. deep and 3 ft. beyond the ends of the ties and have been backfilled with cinders. As they were not carrying off the water an examination was made, and it was found that the heavy power recently installed had forced a stratum of blue clay through the cinders above the tile, shutting off the access of the water into the tile. Under these conditions he had secured the greatest success by digging a deep ditch either with teams or ditchers and then filling it with cinders. M. Connerton (Q. & C.), emphasized the importance of making the depth at which tile is laid dependent on local conditions, being sure to go below all pockets of water in the roadbed. A. E. Hansen (A. T. & S. F.), described his practice of laying 6 in. vitrified bell-end tile below the track ditches with tees and 4 in. laterals extending 1 ft. inside the rail at intervals of about 6 ft. When laying this tile he removed all the old material on the shoulder and backfilled with cinders to enable the water to reach the drains. This construction cost $0.50 per lin. ft. of track, and has drained the roadbed as well as the ditches.

In discussing the sizes of crusher run ballast, L. C. Ryan stated that he has found very little trouble with ballast between the limits recommended by the committee. J. P. Corcoran (C. & A.), uses stone ranging from 1 in. to 2 in. in size. He has found crusher run stone too fine, the finer particles disintegrating and permitting the track to churn. T. Hickey (M. C.), stated that he had secured satisfactory results from stone ranging in size from ¾ in. to 2 in. A. M. Van Auken called attention to the fact that the proportions of stone of the various sizes varies from day to day. H. Van Gorder (C. & N. W.), thought this was caused by using stone from strata too near the surface.

There was an extended discussion regarding the point at which curve worn rail should be removed from the track. T. Hickey considered rail safe until the wheels begin to strike the angle bars. M. J. Connerton disapproved of this guide, as the dimensions of the angle bars vary on different roads. T. Thompson (A. T. & S. F.), advocated the removed of rail when worn ½ in. on the head. W. Shea has prepared three templets for each section foreman for use with A. R. A. 90-lb. rail with a 2¾ in. head. When templet No. 1 (showing a head of 2 3/16 in.) fits the rail, the foreman notifies him. When the rail is worn to correspond with templet No. 2 (2⅛ in. head) he inspects the rail and orders other rail to replace it. When templet No. 3 (with a head of 2 in.) fits the rail, it is taken out at once. On motion of J. Buel (Ark. Cen.), this paragraph was amended to provide that rail on the high side of curves should be removed when the head was worn ½ in.

The recommendation of the committee specifying joints, no portion of which should protrude below the base of the rail, created a great deal of discussion. The committee stated that it had in mind the laying of rail without the spacing of ties in making its recommendation, and while there was no opposition to the practice, it was felt that the recommendation of the committee was too broad, and it was amended to recommend "joints of substantial type, no portion of which protrudes below the top of the tie to permit laying rail in the winter, oil treated steel preferred."

The first half of the paragraph relating to track ties was amended to show that this was offered experimentally and was not to be recommended as standard practice at this time.

While discussing the paragraph regarding anti-creepers, the committee stated this provision was designed to overcome the need for slot spiking joint ties.

In the discussion of switch ties, J. Buel said that in his opinion such ties should be wider than track ties, and with the size of the latter established as 7 in. by 9 in., he believed that the switch ties should be 7 in. by 10 in. J. W. Powers (N. Y. C.), said that he believed additional width was necessary only for the frog ties because of the greater impact to which they were subjected and because of the notching necessary. On the other hand, it was the experience of L. C. Ryan that more switch ties were renewed on account of cutting or decay around spike holes than because of breaking, owing to insufficient strength. With a plate covering the full width of the tie he believed that a 9 in. width is entirely sufficient.

In the discussion of work equipment recommended, J. O'Connor stated that he believed a weed burner was one of the most economical and efficient devices for getting rid of weed. His method of procedure is to make one run with the burner to kill or dry up the weeds. After an interval of two or three weeks the weeds are thoroughly dry and a second run then burns them completely. In answer to inquiries concerning trouble with fires in ties he stated that this danger was very slight. In crossing a pile trestle or a deck bridge it is not even necessary to put out the fire on the burner, but the burner is simply raised until the bridge has been crossed. Two section

hands following with a barrel of water on a push car can readily put out any fires that start in the ties.

J. Buel reported adversely regarding the use of chemical weed killers, stating that weeds were killed temporarily, but came up again. The chemical he had used was poisonous and resulted in the death of stock. L. C. Ryan stated that he had made one application on 100 miles of double track late in July, 1914, which killed all of the weeds for the rest of the season at a cost of between $35 and $48 per single track mile. Another application made earlier in the season this year cost only $23 per single track mile. The cost includes the cost of fluid, labor and train service. Last year 90 gal. of the chemical was required per mile, while this year only 60 gal. was necessary. He recommends two applications of 40 gal. each per season. The chemical is diluted 1 to 25. The outfit he used covered 60 miles per day, although greater distance could have been covered if more water tanks had been available. A. E. Hansen objected to the use of chemicals to eliminate weeds from rock ballast. In his opinion it would be better practice to clean the ballast with forks. He had used chemicals to kill weeds on the sub shoulders, using a chemical prepared by the railway company consisting of creosote, potash and arsenic and making one application each season. This cost $52 to $53 per mile and gave good results.

In a discussion of organization and particularly of the need of interpreters, C. King stated that the Long Island and the Pennsylvania have started campaigns of education among their track forces, three-quarters of which are Italians. Most of these men can talk English, but not all of them can read and write it. Most of them are enthusiastic about the plan, which is largely of a correspondence character, although the instructor comes in personal contact with the men occasionally. The course covers the use of track terms and matters closely allied with track work and also includes the principles of "safety first."

J. O'Connor objected to the prevailing tendency to increase the size of roadmasters' or supervisors' districts, stating that with the grade of men now obtained for section foremen, much of the roadmaster's time is taken up in directing such work as the placing of a turnout or crossing which the foreman had previously been able to do without his assistance.

The recommendations of the committee regarding the laying of rail in winter and eliminating the slot spiking of joints created a great deal of discussion. The practices of the different roads which have tried this method were related. One or two members told of difficulties in anchoring light rail carrying heavy power. The consensus of opinion strongly favored the application of sufficient anchors to hold the rail from creeping without slot spiking the joints.

In discussing the method recommended for relaying rail and particularly the statement regarding the adzing of ties, the question was raised as to the merits of the canting of rails. D. O'Hern (E. J. & E.), advocated this practice based on extended experience with it. Other members opposed it. To get the question before the convention, L. C. Ryan moved that it be recommended that rail be laid vertical, which motion carried.

PROPER ORGANIZATION OF SECTION FORCES AND METHODS FOR MAINTAINING AND POLICING TRACK. FOR LIGHT CONSTRUCTED RAILROADS CARRYING HEAVY TRAFFIC

There is no item of more vital importance than the proper construction and care of the roadbed. When it becomes necessary to remove the cap soil in perfecting the grade, it should be replaced, as it will stand up and shed the water much better than earth beneath the surface. The roadbed should be reinforced at every point permissible and properly drained. No water should be allowed to stand in borrow pits or in pockets near the roadbed. The top width of roadbed should be 18 ft. for main track and 16 ft. for side track. The shoulders of fills and the lines of ditches in cuts should be regular and parallel with the track. Ditches at the ends of the cuts should be curved away from the fills so that the slopes of the ditches will not be washed away.

Earth taken from ditches should not be thrown on the slopes or tops of cuts but should be distributed evenly on the slopes of fills. When ditching, care should be taken to keep material from falling on the ballast or at the ends of ties. Cross drains should be put in where necessary. All ditches and culverts and the ditches leading to them should be kept clear of mud, drift or other obstructions. Where water is beginning to undermine culverts or other masonry, prompt steps should be taken to stop the damage by the use of rip-rap or by some other means. Surface ditches should be cut above the upper slope of side hill cuts when the natural material is unlikely to slide on account of surface ditches. These ditches should be at least 10 ft. from the top of the slope of cuts. A 6-ft. beam should be left between the foot of embankment and the edge of borrow pit or ditch. Ditches should have sufficient slope to carry the water off rapidly but the depth should not be sufficient to weaken the roadbed.

Live cap soil makes the best ballast, if obtainable. In absence of this we would recommend the use of gravel or cinders, especially for soft, rotten spots in the roadbed.

Cross ties should be 6 in. by 8 in., by 8 ft. preferably of hard wood, uniform in size and thickness; no less than 18 ties to a 30-ft. rail in main track and 16 to a 30-ft. rail in side track. Soft wood ties should be treated with a suitable preservative. Tie plates should be used when practicable.

In laying steel, rails should be laid joints evenly broken in order to space the ties properly. The allowance for temperature variation should be from ⅛ in. to ⅜ in.

When center stakes are given the track should be lined accurately to them. Center stakes should be preserved. Track should be lined before it is surfaced; then when surfacing is completed the finishing should be given. Curves should be approached with uniform elevations of the outer rail on regular curves and with the elevation varying with the curvature on spiral curves. The level-board should always be used when surfacing or smoothing track.

No curve should be elevated more than 5 in. Elevation must be governed by the location, degree of curvature and speed of trains. Easements should be to 40 ft., except on reverse curves. The elevation should be proportioned according to the location and degree of curvature. The gage on curves sharper than 4 deg. should be widened from ⅛ in. to 1 in., according to the degree of the curve.

Tightening Bolts

Joints should be full bolted and kept uniformly tight. In general, bolts should not be tightened in extremely hot or cold weather.

When rails creep so as to close the expansion spaces at joints along one stretch of track and open them at another, the rails should be drifted back when these spaces exceed ⅜ in. To offset this, large select ties should be placed under joints and spiked in slots; good rail anchors or rail anti-creepers installed.

Sections should not be longer than 6 miles for single track. Foremen should be allowed one man for each mile eight months in the year and sufficient force during winter months with extra allowance for handling snow. When practicable, section crews should be located at the center of their sections.

Every fifth telegraph pole should be numbered. During the last months of the calendar year the track should be gone over carefully, estimating the number of defective ties located between these poles to the end that ties may be distributed where they are needed, thus saving expense of trucking as much as possible. Ties should be distributed not later than February. March, April and May are the three principal months for tie renewals. In the meantime, right-of-way fences, cattle guards and wings and crossing planks should be looked after so as not to interfere with spring work. Following the tie renewals comes the spotting up and resurfacing, cutting weeds and grass

on the track and right-of-way and then ditching and general cleaning come in order.

Section motor cars should be furnished as far as practicable.

J. BUEL (Ark. Cen.) Chairman.

DISCUSSION

At the suggestion of J. Sweeney (C. & E. I.), the paragraph on ties was amended to add after soft wood ties, "And such hard wood ties as will take treatment should be treated, etc." In the discussion of the paragraph on maximum elevation, M. Burke (C. M. & St. P.), did not think that 5 in. was sufficient elevation for all speeds. J. Buel explained that it was the opinion of the committee that the speed on light constructed railroads such as are under consideration in the report of this committee, would necessarily be restricted by such amounts as would permit safe operation around all curves at elevations not exceeding 5 in. He explained that it was his experience that mud ballast would not permit of greater elevation, that the tracks would slip, or that the ties would settle under the low rail and give excessive elevation if the track is not watched very closely. This opinion was confirmed by other members. On a motion by W. Shea (C. M. & St. P.), this section was amended to read "That the maximum speed on the class of roads covered by the title of this report shall be 40 miles per hour, and that the maximum superelevation of curves shall be 5 in."

The recommendation of the committee that the gage on curves sharper than 4 deg. should be widened, created extended discussion. The practices of several roads were described, showing that there has been a tendency during recent years to maintain the track to standard gage on curves up to 8 and even to 10 deg. A number of the members opposed the recommendation of the committee and it was finally voted down.

In discussing the recommendation regarding the length of sections, W. Kofmehl (C. M. & St. P.), stated that it was entirely practical to handle sections 7 to 8 miles long with motor cars. J. O'Connor emphasized the importance of the density of traffic on the allotments of section forces and the difficulty of establishing any uniform allowance. He favored sections with a maximum length of 6 to 7 miles on heavy traffic single-track lines, equipping such sections with motor cars. Over 500 sections on his road are now equipped with such cars.

PROPER ORGANIZATION OF SECTION FORCES AND METHODS FOR MAINTAINING AND POLICING TRACK FOR LARGE TERMINALS

We have taken as our basis for the report a terminal consisting of approximately 150 miles of track which handles on an average the following traffic each 24 hours: Freight trains, 102; passenger trains, 111; light engines, 87; passenger cars, 888; freight car loads, 2,206; freight car empties, 405.

Working on the basis of a man to the equivalent mile of main track we recommend for a summer force—0.75 man and for a winter force—0.50 man. Equivalent mileage is to be computed on the following equivalents for 1 mile of main track: 1½ miles of siding, 15 switches, 20 interlocking derails, 7 single-track diamond or right-angle crossings, 5 movable-point crossings or double slip switches, 20 single track plank crossings, 24 ft. in length.

Four miles of main line and 12 miles of side track or its equivalent is a normal section for one foreman. Each section crew should be organized to consist of 1 foreman, 1 assistant foreman, 1 track walker, 1 lamp man and yard cleaner combined and enough laborers to make the gang equivalent to 0.75 man per mile in summer and 0.50 man per mile in winter. The foreman should be allowed to employ the laborers in his own gang if it is possible. The assistant foreman should be picked from the laborers by the foreman, roadmaster or supervisor.

Each section crew should make all tie, rail, frog and switch renewals until such time as it becomes necessary to relay a certain track out of face or to relay a lead out of face when the section foreman should be given an additional allotment of men.

Cleaning Tracks

Yard cleaners should keep rubbish, coal, etc., picked up from the tracks and right-of-way and piled in places where it can be picked up at stated intervals. Team tracks and freight-house tracks should also be kept clean at all times by one or more regular men.

A sufficient amount of emergency material should be kept at one or two convenient places where it can be easily reached and quickly loaded when needed. Power derricks should be used when electricity or air is available. Rails and ties for the season's requirements should be piled in a yard so that a work train could easily and quickly load each section crew's daily requirements. This material should only be distributed the day it is to be used if it is along a track or where switchmen and trainmen have to walk.

Rail in heavy switching leads should not be lighter than 80-lb. section. Switch ties should be 7 in. by 9 in., white oak preferred and tie plated. Nothing shorter than a No. 9 frog should be used in leads or other yard tracks where frequent heavy switching is performed. Frogs should be so constructed that ordinary angle bars can be applied at either end without difficulty. Guard rails should be at least 10 ft. long and securely fastened to the main-track rails. Nothing shorter than a 15-ft. switch point should be used and a cast-steel filler should be placed in the heel of each switch point.

When making tie and rail renewals on an entire track through the yard, the track should be taken out of service. Rail, ties and other material needed should be distributed by work trains and the old material taken out should be picked up by the trains before the track is put back into service.

In a terminal as above mentioned the roadmaster or supervisor should have a regular work train. Each supervisor or roadmaster should also have one blacksmith and helper. One or more carpenters should be assigned to each roadmaster or supervisor to repair fences and gates, plank street crossings and do other miscellaneous work. Track walkers do not relieve the section foreman of the duty of personally policing his own territory.

C. S. BROOKS (T. R. R. A. of St. L.), Chairman.

DISCUSSION

In discussing the equivalent mile classification M. Burke (C. M. & St. P.), objected to 1½ miles of siding as equivalent to 1 mile of main track, as in his opinion the cost of maintaining a mile of main track is much more than for that amount of siding. On the other hand, he objected to 15 as the equivalent in railroad crossings of a mile of main track, stating that on that basis he would much prefer to maintain the latter. D. McCooe (G. T.), stated that in his experience with a terminal including 150 miles of track, a large part of the mileage classed as sidings would be subject to frequent train movements—much more than would be received by the ordinary standing track. This explanation was extended by L. C. Ryan (C. & N. W.), who called attention to the fact that the term sidings in this classification included all tracks other than main tracks. A suggestion by A. M. Van Auken that the classification should be further subdivided met with disfavor. A question by J. B. Kelly (M. St. P. & S. S. M.) as to whether traffic was to be taken into account in this classification was answered in the negative. D. McCooe made reference to the equivalent-mileage basis proposed by the American Railway Engineering Association and said that it was applied to sections on his districts with the result that one section including only 1½ miles of main track was found to be equivalent to 16 miles on the equated basis. After extended discussion regarding the number of railroad crossings equivalent to a mile of main track, the report was amended to read 7 cross-

ings instead of 15. The rest of the report was accepted as information without further comment.

NEW AND EXPERIMENTAL TRACK ACCESSORIES AND TOOLS

Miscellaneous

The gasoline motor car has been perfected so that it will now perform satisfactory work under the most severe conditions. What we mean by severe conditions are heavy grades, heavy loads, strong head winds, etc.

Rail benders have been improved so that rail can be bent or curved nearer the end than with the old style Jim Crow, making a much more desired tool.

Rail-laying machines for relaying steel are still being improved and are warranting the support they have been given.

The tool grinders now on the market with their different attachments for holding the different tools properly on the face of the stone are a decided improvement over the old grinding stones and flat files formerly used.

Track drills have been improved so that they are much more substantial. They can be released from the rail and set up with much greater ease than formerly.

The mechanical percussion tamper is now being used and perfected. This fills a long-felt want of the track department and should be encouraged by all roadmasters, especially in yards and terminals, where the machines can be operated from pneumatic signal lines without the expense of additional power.

A material improvement in steel fence posts has been made in the last year or two. There are now on the market concrete fence post machines which mold eight posts at a time. Such machines can be furnished section gangs and they can make cement posts at such times as the weather will not permit outside work. A good concrete fence post can be made for about 18 cents each, not figuring labor and sand. As timber posts are advancing in price each year we recommend the more liberal use of steel and concrete posts.

It is of the utmost importance that the railroads should use the very best tools they can secure, as they are scattered over many hundred miles of road and unless very carefully watched, the service is lost sight of. If tools fail outright they are very apt to be reported, but where they do only 25 to 40 per cent of the work they should, the chances are that the roadmasters will not hear of it. A cutting tool made from cheap carbon steel will cost less than one made from tool steel. It would, however, be ridiculous to consider it more economical.

We have not progressed in the matter of rail joints so far as some people think, even with the many new ideas presented in the last 35 years. We find many trackmen complaining that a certain kind of joint does not keep the track in good line around the joint and they lay the blame on the joint. Similar conditions, however, arise with almost any make of joints. We find that in 95 per cent of the cases the kinks are due to the improper sawing of the rails. We find such conditions exist when the rail is laid with the minimum amount of expansion. Some members of this committee have found 100-lb. rail sawed so short on top that it would cause a ¼ to ½-in. depression of the joint in hot weather. A crooked sawing occurs sideways also and causes 90 per cent of the line kinks. This occurs whether or not joints are spaced. New rail is sawed at the mill before it is gaged. Therefore, if the rail is sawed through a kink and afterwards straightened it becomes noticeable when rail is laid tight as many now practice.

W. SHEA (C. M. & St. P.), Chairman.

THE BANQUET

The fourth annual banquet of the Track Supply Association for the Roadmasters' & Maintenance of Way Association was held in the Auditorium Hotel on Thursday evening, with a total attendance of 271. F. A. Preston, vice-president of the Track Supply Association, acted as toastmaster. In his opening address he stated that his regard for the roadmasters could be expressed no better than by reading an editorial taken from the Los Angeles Evening Express of November 14, 1900, upon the occasion of the Roadmasters' convention in that city. This tribute to the track men called attention to the greater publicity given to the other departments and other officers of the railways and pointed out the importance of the roadmasters and the debt which the public owes to them.

H. R. Safford, chief engineer, Grand Trunk, Montreal, Que., said that the railroads of the United States owe much to the Roadmasters' Association, a debt which he believed they appreciated because of the encouragement which the roads have been giving their roadmasters to attend the annual conventions. Track maintenance involved a great many difficult problems, not all of which can be solved by the use of mathematics or the other exact sciences, but that they all require the exercise of common sense. Although some were wont to feel that this association overlapped another, he believed that this association had a distinct field and that there should be no feeling of competition.

The next speaker was E. T. Howson, engineering editor of the *Railway Age Gazette,* who discussed the track-labor problem.

James Burke, superintendent of terminals, Erie Railroad, Chicago, called attention to the fact that the Roadmasters' Association was one of the few organizations of railway men which did not feel called upon to encourage legislation for the benefit of its own members to the disadvantage of the roads. Instead their efforts collectively and as individuals where characterized by hard work, long hours each day in an effort to do for the railroads all that is possible with the funds placed at their disposal. He urged the older roadmasters to keep in step with the recent progress in the conduct of track maintenance, believing it would be only a few years before almost all operations would be performed by mechanical means, and that this would result in great improvement, in the intelligence of the forces and the rate of pay.

P. J. McAndrews, president of the Roadmasters' Association, said that with the opportunities existing the desire for work, and the encouragement of the higher maintenance officers, the Roadmasters' Association has a future before it which should be highly encouraging to those who have long had the success of this organization at heart, stating that the most important purpose of the organization was for the mutual assistance of the members.

The next speaker was Coleman King, president-elect of the association, who paid a tribute to the section foreman, characterizing them as the most reliable and faithful employees in railway service.

The last speaker of the evening was W. C. Kidd, secretary of the Track Supply Association, who urged all members of the two associations to assist in making the next convention a success.

THE TRACK LABOR PROBLEM

BY E. T. HOWSON

From its very nature the maintenance-of-way department of a railroad is a spending organization. It creates no revenue, but it is responsible for the expenditure of about 14 per cent of the gross income. Its problem is, therefore, to spend this large sum as economically as possible and its efficiency is measured by the extent to which it secures full value for every dollar expended. There has never been a time in the history of railroading when the demand for ability of this nature has been greater than in the past few years of declining railway revenues and continually increasing expenses. As a result it may be stated confidently that our railways are more efficiently managed today than at any other period in their history.

The average roadmaster is responsible for the expenditure of from $150,000 to $200,000 annually, of which approximately 60 per cent goes for labor and 40 per cent for materials. One would, therefore, naturally expect to find the largest amount of attention paid to the organization and handling of labor and secondary attention given to the selection of materials. On the

other hand a search through the proceedings of this and allied associations and through the pages of the technical journals will show that a very large part of the matter published therein relates to materials and to their use, and a relatively small part of the most complicated problem of all—that presented by the human element. Because of this lack of proportion, it is not surprising that those materials comprising the various units of our track construction have reached a high state of development, and that at the same time we have a labor problem of serious proportions confronting us.

The labor problem has never been studied scientifically from the standpoint of the maintenance-of-way department to the extent it deserves or to the extent that it has in other departmens of our railway organization and in outside industries. Take the question of wages alone. The pay of section foremen is not based on any comparison with that in other kinds of skilled labor. The experienced track foreman receives considerably less than a green brakeman on his first run, and much less than the conductor, with whom he compares in responsibility and experience. Also, consider the application of discipline. A conductor or brakeman is given demerits for a minor offense and kept in service, while a foreman is laid off for an offense no more serious, although it takes just as long to train a good section foreman as a conductor and he cannot be spared from the service any more readily than the conductor. The tendency toward the organization of track men into unions is increasing, and unless adequate relief is granted soon, we shall soon have to deal with organized labor in the track department with all the difficulties that this implies.

No one will dispute the statement that there has been a radical change in the personnel of our track forces in recent years. We are all aware of the fact that the English-speaking or north European laborer is drifting into other pursuits, and that his place is being filled by the Italian and Slav of southern Europe. However, this does not in itself explain the problem confronting us.

An economic development has been and still is taking place in this country, affecting the railways and other large industries alike. In this rapid development it is only natural and proper that the men already here and familiar with our language and customs should prosper and move up to positions of more importance. It is to be conceded that the failure of the railway managements to recognize the importance of the track men in matters such as wages and working conditions has hastened the departure of the English-speaking laborer, but it has only hastened and has not caused this change. Any concessions which the managements could reasonably have offered would have served only to delay this transition, for it was inevitable if the country was to develop. Those of you who because of your remoteness from industrial centers are still able to secure native labor are fortunate, but you will soon be confronted with the same conditions. As an indication of the extent to which foreign labor is now employed on the railroads, attention is directed to the fact that over 11,000 Italians alone are employed on the Pennsylvania Railroad east of Pittsburgh and Erie, most of whom are in the maintenance-of-way department. On several eastern roads practically 100 per cent of the track laborers are foreign.

This is the condition to-day. These men have different racial characteristics from those who preceded them, and for this reason we must adapt our methods somewhat to their customs if we are to secure satisfactory results, just as we handle manganese steel differently from open hearth. The foreign laborer is here to stay and the efficiency of the roadmaster of the future will be measured by the extent to which he is able to secure the full results from this labor. The track laborers of today come to this country very largely from southern Europe. They are the raw material from which we must create our track men and our foremen of the future as well. One of the most serious handicaps of foreign laborers is their inability to understand and speak our language. As long as they remain in this condition they can be only partially efficient. To aid them in this regard the Pennsylvania has prepared an Italian-English track course whereby they may be taught the elements of English and of track work at the same time. The Union Pacific prepared a similar course a few years ago for its Japanese track laborers. The Central Railroad of New Jersey and other roads conduct night schools for their men at various terminals.

Having acquired the elements of our language it is self-evident that they will make better and more efficient workmen. This educational work is not confined to the instruction of foreign laborers alone, for several roads are now placing similar courses at the disposal of their native track laborers and foremen as a means of instructing them in track work, increasing their efficiency and preparing them for promotion.

Another aid in the solution of the labor problem is the increased attention which is being given to the physical welfare of these employees. The day is passing rapidly when any vermin-infested old box car with a leaky roof is considered suitable to house track laborers. Even though these men may not be used to our scale of living, they appreciate care and attention, and measures taken for their physical comfort are a material aid in holding them in the service. I have in mind one supervisor, known to all of you, who fumigates and paints all of his camp cars thoroughly inside and out every spring, making them as attractive and sanitary as possible. I was not surprised when he told me that a large proportion of his floating gang laborers return to him year after year. While wages are an important consideration in holding laborers, they are not the only one. I know one road that is paying its track laborers 2½ cents an hour less than its neighbors and holding all the men it needs, largely because of such measures. This is a very good dividend in itself.

The wage problem is one on which there is a wide divergence of opinion. Most discussions of this subject have ignored the fact that labor is a marketable commodity the same as wheat and that it fluctuates according to the same law of supply and demand. For this reason, while I advocate educating and caring for labor to secure an ample amount of it and to increase its efficiency, I do not believe in paying above the prevailing market rates for temporary or floating gang laborers. While theoretically a higher rate enables the better men to be secured, in these days of large organizations when men are hired in gangs this benefit is seldom realized. Although it is true that gangs differ in ability, one will find some good and some poor men in almost every gang. Even in times of labor shortage the act of one road in paying higher than the market rates to secure labor only demoralizes the forces on all roads without increasing the supply of labor.

So much for the floating gang laborer. With the regular laborer conditions are somewhat different. A wage rate must be sufficient to encourage men to remain in the service, for the constant employment of inexperienced men is expensive. At the same time, with the prospect of steady work throughout the year, the better class of men are willing to work for less than the highest market rates. The most important single step which can be taken today for the development of an efficient organization is the adoption of permanent employment throughout the year for as large a proportion of the force as possible. When we could recruit all the track laborers we required from among the farmer boys along the line who were not dependent upon such work for their entire livelihood it was advisable to do as much work as possible during the more favorable summer season. Now, when good labor is scarce at any season, we still continue to crowd as much track work as possible in the three months from July to September, inclusive. It does not require any knowledge of mathematics to demonstrate that if this season is extended from April to September, inclusive, only half the force is required, and many roads have so extended their seasons. If this was extended further over the entire year, the forces necessary would again be reduced. You may say that this is impractical, and I will grant you that this is true in a

measure, particularly for the northern roads, but not to the extent commonly considered. The reorganization of track work, as carried out on the Long Island and the Frisco, whereby uniform section forces are employed throughout the year, may not be feasible in its entirety on the more northern roads, but they are all crowding much more work into the busy summer season than is necessary.

Another measure which will assist in holding the efficient laborer in the service is the establishment of a graded rate of pay. In its simplest form this consists in the selection of a leading laborer in each gang, perhaps with the title of assistant foreman, who receives a cent or two per hour more than the regular laborers. It has been suggested seriously that this be carried still further and that three or four scales of pay with minor gradations be established to reward men for increased length of service and efficiency. If the higher rates are awarded because of merit, they form an excellent incentive for a man to endeavor to improve his work, but if the men are selected because of favoritism or simply in order that the positions may be filled, the purpose of the plan is defeated. Its success depends almost entirely on the manner in which it is administered.

The condition as respects the foreman is more serious than as respects the laborer. The faithful and capable foreman of the old school is fast disappearing, and because of the lack of attention given the laborer, suitable material is not being developed to fill the vacancies. With the native laborer entirely gone or rapidly disappearing, it is evident that we must look to the foreigner for our future supply of foremen as well as laborers. That the foreigner has demonstrated his ability to make good as a foreman is shown by a recent census taken on the Pennsylvania Railroad east of Pittsburgh and Erie, as a result of which it was found that there were 75 Italian section foremen and 187 assistant foremen on the road.

Whether the foreign foremen will be content to remain in track work or will go into other industries which offer greater rewards when they have acquired a knowledge of our language and customs is a question. Profiting by the experiences of the past, many of the roads are adopting measures of one kind or another which will delay the repetition of any such transition. In the first place, the wages of section foremen have been raised quite generally during the past five years, but they are still considerably below what they should be. The section foreman is an officer on the railroad, responsible for the expenditure of $5,000 or more annually, and he should receive a salary sufficient to create a desire to retain his position. Based on a comparison with other branches of the service, I believe a section foreman on a main line should receive at least $90 a month. I do not mean that all men now filling this position are worth this amount, but that with a salary fixed at this figure men should and can be secured who are.

The section foreman should also be given an annual vacation with pay. I believe that every man should be paid for all time he works and that he should be allowed overtime. It is a hardship to ask any man to get up in the middle of the night to patrol his track during a storm when he knows he will receive nothing for this, and it is surprising that the foremen do this as faithfully as they do. If overtime is not paid, a vacation of ten days or two weeks with transportation and full pay, customarily allowed salaried employees, would compensate him for this extra work, would give him a standing in the eyes of his men and the community, and would make of him a better and broader employee. I am not suggesting an idle theory, for at least one eastern road gives its men such a vacation each year.

Another means of securing and holding good foremen is to insure them tenure of position as long as they handle their work properly. Too frequently a foreman is discharged hurriedly without a full investigation of all the facts. This not only affects the foreman directly concerned, but the news spreads along the line and serves to demoralize the entire organization. To prevent rash acts of this kind, one road requires that no man shall be taken out of service except for drunkenness and equally serious offenses, until a full report has been made to the superior officer and the recommendation of the supervisor approved.

With the continued industrial development of this country the measures outlined above will materially aid, but will not permanently solve the track-labor problem. The railways are a tremendous factor in our industrial life, requiring over 400,000 men for track work alone. The surest way to avoid a labor shortage is to reduce the number of men required by the substitution of labor-saving equipment wherever practicable. If one will compare the manner of performing work in our leading industrial establishments with that on the track, he cannot but be impressed with the fact that in their track work the railways are backward in the development of labor-saving appliances. This condition can be explained only partially by the statement that track work is varied in character. A further explanation is the inertia surrounding railway track work and the lack of really concentrated study of the possibilities of mechanical development. There is a definite field for the use of labor-saving devices which will not only reduce the number of laborers required, but will effect material economies in the cost of maintenance. I believe we are now on the threshold of a new era in track work in which there will be great improvements if we, railway men and manufacturers alike, will co-operate and give these new developments our sympathetic support.

The motor car is rapidly replacing the old hand car on main and branch lines alike. The usefulness of the tie-tamping machine has been demonstrated to you, and I believe it is still in the first stages of its development. One road has developed a machine for drilling rails and has reduced materially the cost of putting on bolted rail anchors in this way. This same road is endeavoring to perfect a device to saw the battered ends from the rails without removing them from the track. It is not a long step from the construction of a pneumatic tie-peeling machine to the construction of one that will adz ties. The Lehigh Valley has substituted locomotive cranes for tong men when relaying rails with excellent results. These are only a few of the possibilities in this direction. I, personally, believe that the present section motor car furnishes the power unit about which many of these various attachments will be grouped, and that instead of providing separate equipment for each class of work our section gangs of the future will be given motor cars with attachments to tamp ties, drill rails, etc., thereby using the motor all day instead of only for a short time at morning and night. When this time comes the amount of labor required will be reduced greatly, and that which will be employed will be of the skilled mechanic class, drawing better wages and doing more constructive work.

These various measures can be brought about primarily through the active interest and co-operation of all concerned. In many ways, the care of his men rests directly on the supervisor and the successful man is successful in this regard. It is not a special dispensation from the general office that enables one supervisor I have in mind still to retain all his native foremen, while neighboring supervisors on the same and adjacent roads have been forced to hire foreign foremen largely. In other matters such as the establishment of wage rates and the purchase of special equipment, authority must come from higher officers, but here as well the roadmaster has a very important part. It is his duty to study these problems at first hand, and having reached his conclusions to present them to his superior officers with sufficient data to prove his case. If he fails to convince them the first time, it is his duty to bring this matter up again on an opportune occasion, being sure in every instance that he is correct. It is only in this way that progress may be made; and the part to be played by the supervisor is most important.

INSPECTION TRIP

Wednesday was spent in an inspection of the railway terminals of Chicago. About 350 members and guests of the association left the North Western terminal on a special train at 9 o'clock going direct to the Stock Yards, where visits were made to the

Armour and Libby, McNeill & Libby packing houses. Lunch was served at the Stock Yards Inn, after which the train proceeded over the tracks of the Chicago & Western Indiana to the new clearing yard, where a short time was spent watching the operation of this terminal. The party returned to the North Western station late in the afternoon over the Belt Railway.

CLOSING BUSINESS

The selection of a location and date for the 1916 convention resulted in an extended discussion. New York was finally selected with a vote of 108 as compared with 26 for Chicago, and the date was fixed at September 19-22, 1916, inclusive.

The following officers were elected: President, Coleman King, Long Island, Jamaica, N. Y.; First Vice-President, M. Burke, Chicago, Milwaukee & St. Paul, Chicago; Second Vice-President, Abel Grills, Grand Trunk, St. Thomas, Ont.; L. C. Ryan, Chicago & North Western, Sterling, Ill., Secretary; W. H. Kofmehl, Chicago, Milwaukee & St. Paul, Elgin, Ill., Treasurer. Members of executive committee: James Sweeney, Chicago & Eastern Illinois, Danville, Ill.; W. Shea, Chicago, Milwaukee & St. Paul, Ottumwa Junction, Ia., and J. B. Kelly, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

THE TRACK SUPPLY ASSOCIATION

The annual meeting of the Track Supply Association was held on Friday morning. The officers for the past year were: President, E. M. Fisher, Fairbanks, Morse & Co.; Vice-President, F. A. Preston, P. & M. Company; Secretary-Treasury, W. C. Kidd, Ramapo Iron Works. The reports of these officers showed the association to be in a healthy condition.

The following officers were elected for the ensuing year: President, F. A. Preston, P. & M. Company; Vice-President, R. A. Van Houten, Sellers Manufacturing Co.; Secretary-Treasurer, W. C. Kidd, Ramapo Iron Works; director for two years, E. T. Howson, *Railway Age Gazette;* director for one year, J. J. Cozzins, Union Switch & Signal Company.

EXHIBITS

The following companies had exhibits at the convention:

The Acme Supply Co., Chicago—Exhibiting the Gosos bed. Represented by P. J. Burke.

American Flexible Bolt Co., Pittsburgh, Pa.—U. S. track bolts. Represented by C. A. Seley.

American Guard Rail Fastener Co., Philadelphia—Guard rail clamps. Represented by D. L. Vaughan and L. P. Burwell.

American Hoist & Derrick Co., St. Paul, Minn.—Photographs of American railroad ditcher. Represented by Edward Coleman and C. C. Austin.

American Steel & Wire Co., Chicago—Woven wire fence and galvanized steel fence posts. Represented by L. P. Shanahan, C. J. Boon, A. Alexander, J. W. Collins and F. B. Fraude.

The American Valve & Meter Co., Cincinnati, Ohio—Economy switch stands, Anderson interlocking safety switch stands and safety switch locks. Represented by F. C. Anderson.

The Anchor Co., Chicago—Exhibiting the Efficiency Rail Anchor. Represented by T. B. Bowman and C. P. Williams.

Ajax Rail Anchor Co., Chicago—Exhibiting rail anchors. Represented by F. B. Bradley, P. Hoffman and G. Holmberg.

The Buda Co., Chicago—Exhibiting the Buda Hy-duty Grinder. Represented by Emil Johnson and Wm. Krause.

Carnegie Steel Co., Pittsburgh, Pa.—Steel rails. Represented by Norman Hench and George Landers.

The Chicago Malleable Castings Co., Chicago—Exhibiting the Thomas rail anchor, tieplate, and Thomas guard rail. Represented by J. W. Thomas.

Commercial Acetylene Railway Light & Signal Co., New York City—Flashlight signals and acetylene signal lights. Represented by H. C. Doran and F. S. Dickinson.

The Creepcheck Company, New York—Exhibiting Dinklage creepcheck rail anchors. Represented by W. S. Schmalholz.

Crerar, Adams Co., Chicago—Exhibiting track drills, binding drills, track jacks, flare lights, guy starters, shovels, pumps and tools. Represented by R. W. Wallace, Geo. Bassett, Arthur Martin, Tom Barrett and W. I. Clock.

Daniels Safety Device Co., Chicago—Exhibiting bull dog and bull pup nuts. Represented by F. M. Daniels, A. G. Wood and C. F. Ames.

The Duff Mfg. Co., Pittsburgh, Pa.—Exhibiting genuine Barrett jacks, Duff ball-bearing screw jacks and Duff Bethlehem hydraulic jacks. Represented by C. N. Thulin.

Fairbanks, Morse & Co., Chicago—Section and inspection motor cars. Represented by F. M. Condit, K. P. Brown, D. J. Higgins and L. H. Matthews.

Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn.—Exhibiting the Fairmont hand car, gasolene engine and parts and photographs of motor cars and wood cutters. Represented by H. E. Wade and W. P. Kasper.

The Frictionless Rail, Boston, Mass. Represented by T. F. Dwyer, Jr., and G. H. Bryant.

The Hatfield Rail Joint Co., Macon, Ga.—Exhibiting Hatfield rail joints. Represented by T. B. Bowman and C. P. Williams.

Hayes Track Appliance Co., Richmond, Ind.—Hayes derailers. Represented by S. W. Hayes, E. L. Ruby and E. W. Brown.

The Indianapolis Switch & Frog Co., Indianapolis, Ind.—Exhibiting the Eymon continuous crossing and manganese frogs. Represented by J. C. Jameson.

Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.—Grinders and attachments. Represented by H. C. Holloway, D. L. Braine and W. H. Davis.

Lackawanna Steel Co., Buffalo, N. Y.—Abbott joint plates, hook shoulder tie plates and improved angle bars. Represented by A. H. Weston.

The Madden Company, Chicago—Three-man track layer, Richter blue flag derails, the Blair tie spacer and Wagner switch point straightener. Represented by H. C. Holloway and T. D. Crowley.

Mudge & Co., Chicago—Exhibiting Mudge motor cars and Mudge engine equipment for hand cars. Represented by Burton W. Mudge, R. D. Sinclair, Geo. W. Bender and Sherman C. Amsden.

M. W. Supply Co., Philadelphia—Vaughan rail anchors, track indicators and splice straighteners. Represented by D. L. Vaughan and L. P. Burwell.

The National Lock Washer Co., Newark, N. J.—Exhibiting nut locks and Hi-power nut locks. Represented by John B. Seymour, Jesse Hough, L. Van Thompson and John Patterson.

The National Malleable Castings Co., Cleveland, Ohio—Exhibiting malleable rail braces and tieplates, and malleable washers and rail anchors. Represented by J. J. Byers, T. W. Aishton, J. S. Slater and L. S. Wright.

Northwestern Motor Co., Eau Claire, Wis.—Hand car gasolene engines and motor cars. Represented by R. R. Rosholt and F. W. Anderson.

The P. & M. Company, Chicago—Exhibiting anti-rail creepers, Betts anti creepers, tieplates. Represented by F. A. Preston, A. R. Sutter, W. W. Glosser, D. T. Hallberg, R. W. J. Harris, J. E. Mahoney and G. E. Johnson.

The Pennsylvania Steel Co., Steelton, Pa.—New Century switch stands, Positive switch stands, Mayari heat treated bolts, adjustable rail braces and never-slip switch plates. Represented by W. H. Allen and S. H. Smith.

Positive Rail Anchor Co., Louisville, Ky.—Exhibiting Positive rail anchors, Betts tieplates, Betts guard rail holders, Economy separable switch points. Represented by W. M. Mitchell, F. M. Robbins, L. C. Ferguson, J. A. Schoulty, B. B. Betts and W. A. Wallace.

The Q. & C. Company, New York—Vaughan rail anchors, Bonzano joints, Bonzano step joints, guard rail clamps, insulated joints, tieplates, derails. Represented by A. Robertson, A. R. Horne, J. V. Westcott and Henry Hawes.

The Rail Joint Co., New York City—Continuous frog and switch girder, step high tee, Weber, Standard and insulated and 100 per cent. standard rail joints. Represented by L. F. Braine, V. C. Armstrong, G. C. Isbester, F. C. Webb, G. H. Larson, F. M. Hill, W. S. Boyce, C. B. Griffith, H. C. Hickey, Charles Jenkinson, C. J. Webb, F. S. Webb, George T. Willard, J. L. Terry and J. N. Meade.

Railroad Supply Co., Chicago—Exhibiting derailers and tieplates. Represented by H. G. Van Nostrand and E. H. Bell.

Ramapo Iron Works, Hillburn, N. Y.—Automatic switch standard, guard rail clamps and rolled steel slide plates. Represented by W. C. Kidd, Thomas E. Akers, Arthur Germunder and E. P. Bigelow.

Reading Specialties Company, Reading, Pa.—Exhibiting derailers, step joints and rail benders. Represented by B. J. Buell.

Sellers Mfg. Co., Chicago—Exhibiting anchor bottom wrought iron tieplates. Represented by Geo. Sellers.

Templeton, Kenley & Co., Ltd., Chicago—Exhibiting Simplex jacks. Represented by A. E. Barron, W. B. Templeton and John F. Stevens.

Track Specialties Co., New York—Exhibiting insulated joints, Superior rail joints, guard rail braces and clamps, rail benders and derailers. Represented by W. B. Lee and W. H. Lee.

The Union Switch & Signal Co., Swissvale, Pa.—Exhibiting Keystone insulated rail joints. Represented by J. J. Cozzens and J. D. Roett.

Verona Tool Works, Pittsburgh, Pa.—Track jacks, tools, nut locks, levels and gages. Represented by H. Fischer, E. Woodings, H. Mull and W. D. Achuff.

Wm. Wharton, Jr., & Co., Inc., Philadelphia, Pa.—Exhibiting W. J. switch stands and Wharton-O'Brien insulated switch rods. Represented by Thos. O'Brien, H. F. McDermott and A. S. Partridge.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since August 20, 1915:

Building Concrete Caissons in the Platte River.—The Chicago, Burlington & Quincy has used this form of construction in a long-deck girder bridge at Ashland, Neb. This work was described in an illustrated article in the issue of August 27, page 383.

Flood Damage to Railroads in the Middle West.—On August 16 a severe storm visited Galveston, but property damage was limited almost entirely to the Galveston Causeway. During the week this storm reached St. Louis, Mo., causing damage which seriously interrupted railroad traffic. The effect of this storm upon the railroads is described in an illustrated article in the issue of August 27, page 393.

A Car Dumping Machine with Improved Features.—The Pittsburgh & Conneaut Dock Company has installed a modern car dumping machine at Conneaut Harbor, Ohio, which is used to handle the coal traffic of the Bessemer & Lake Erie. A description of the plant which is designed to unload 100-ton capacity cars at the rate of one a minute, was described in an illustrated article in the issue of August 27, page 390.

Construction of the New York Connecting Railroad.—Material progress is being made on the four-track railroad to connect the New York, New Haven & Hartford with the Pennsylvania in greater New York. This project includes the Hell Gate bridge, which will be the longest span steel arch in the world. The work is unusual in other respects, particularly as to the magnitude. This article which was devoted principally to a record of the progress being made on the various portions of the work, appeared in the issue of September 3, page 421.

The Licensing of Engineers.—At the last session of the state legislature of Illinois, a law was passed providing for the licensing of structural engineers. The effect of this law upon the design and con-

struction of railway structures within the state of Illinois was discussed in an editorial in the issue of September 10, page 452.

Important Realinement Problem on the Pennsylvania.—This road has recently completed the construction of three tunnels on the Allegheny division which eliminates 12.23 miles of line and a large amount of curvature. The work on the tunnel near East Brady, Pa., is of special interest because of difficulty experienced with falling rock. A complete account of this was given in an illustrated article in the issue of September 10, page 456.

An Interesting Structure Over the Buffalo River.—The Delaware, Lackawanna & Western is building a Strauss bascule span at Buffalo which involves complicated foundation problems. These were solved by the use of open reinforced concrete caissons with interesting details. This was described in an illustrated article in the issue of September 10, page 465.

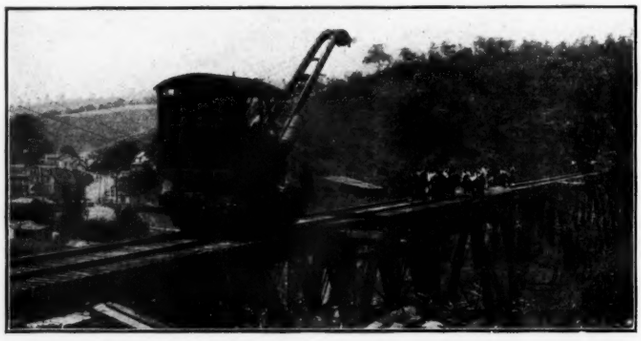
RENEWING BRIDGE TIES ON THE LEHIGH VALLEY WITH A LOCOMOTIVE CRANE

An unusual record in the renewal of bridge ties has just been made by the maintenance of way department of the Lehigh Valley on its bridge across the Susquehanna river at Towanda, Pa. Two main tracks are carried over the river on a steel bridge consisting of 14 deck plate girder spans, 13 of which are 129 ft. 6 in. long over all, and one 125 ft. 3 in.; the total length of the structure is 1,808 ft. 5 in. The five spans nearest the center are on a tangent, but the remaining spans at either end are on 3-deg. 30-min. curves of reversing direction. There are 1,522 8-in. x 12-in. x 12-ft. ties on each track. Together with the elevation blocks, amounting to 14,500 ft. B.M., there is a total of 160,612 ft. B.M. of timber in each track. The track is of 100-lb. rail, with 90-lb. guard rails. The ties had been previously framed and the superelevation blocks were attached.

All of the timber in the eastbound track on this bridge was renewed in an actual working time of 12 hours.

It had been the plan to complete the work in every detail in one day—between 6 a. m. and 7 p. m., but at 1:30 on the day selected a terrific wind and rain storm arose, which came so suddenly and raged with such fury that the gangs were unable to work. In fact, for a while the men had to hold on or lay down to keep from being blown off the bridge. Later it was necessary to send portions of the forces on motor cars in both directions to look after points where trees had been uprooted, and wires blown down where the tracks were under water and where small slides had occurred.

Work was resumed about 5:30 p. m., but half an hour later the storm broke again with such violence that no more work could be accomplished that day. At 8 o'clock the following morning work was resumed and by 1 o'clock every detail, including full tie-plating and spiking and the installation of the metal guard rails, had been completed. Between the old bridge ties the tops of the girders had been cleaned and painted previously, and as the old ties were removed the portions of the tops of the girders uncovered were treated similarly. During the progress of the work temporary crossovers were installed at each end of the bridge to provide for single track operation while one track was out of service, the pilot using a motor car.

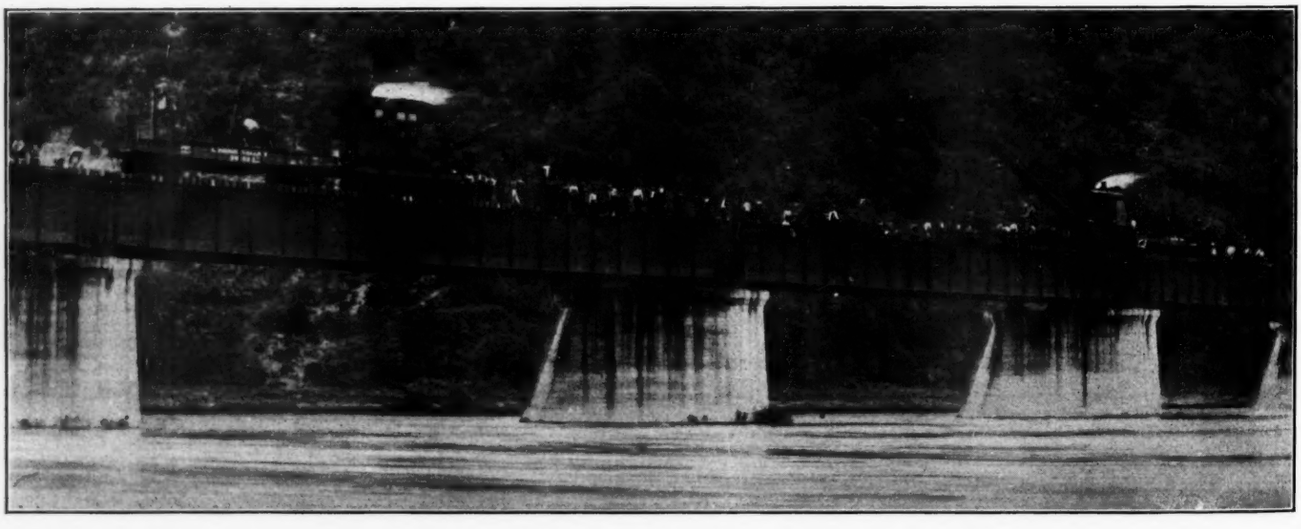


Renewing Ties on a Branch Line Viaduct

Locomotive cranes were used to remove the old ties, to place the new ties and to handle all the rail. The new ties were on 12 cars, arranged in piles in order, each tie being numbered, so when each sling of ties was placed on the girders, each tie was within a few inches of its designated location. The cars of new ties were attached to the locomotive cranes, and the old ties were loaded on them as the new ties were unloaded. The result was that when the job was completed there were no old ties and timbers to pick up.

The total cost of the work, including the installation and removal of the temporary crossovers was $708.90, or 46 cents per tie. Had it not been for the storm this cost would have been reduced to 31 cents per tie.

Working on a single track branch line recently the same department renewed some of the ties on a 1,279-ft. bridge at a cost of 20.4 cents per tie, but no temporary switches had to be installed in this case. The easterly end of the bridge was on a tangent, and the westerly end on a 7-deg. curve. Using a locomotive crane to handle both the old and new ties, 359 8-in. x 12-in. x 11-ft. ties, and 6 8-in. x 12-in. x 14-ft. ties were renewed. The new ties were in rotation piles, ten being placed on the girder at one time.



Renewing Ties on the Bridge Over the Susquehanna River at Towanda, Pa.

The Efficiency of Motor Cars for Section Forces*

Advantages Gained by the Use of Motor Cars on the St. Paul's Illinois Division; Proper Care of These Cars

By G. R. Morrison

Superintendent C. M. & St. P., Savanna, Ill.

The evolution from the old section handcar to a motor car was accomplished in a day on the Illinois division, 27 cars being put in service at one time in 1909. When the question first arose as to the practicability of motor handcars several tests were made on the Illinois division and it was decided that the car weighing about 700 lb. and producing 7½ horsepower could be made to render satisfactory and economical service.

Under the old arrangement we were using 37 handcars with that number of foremen, while under the new plan with motor cars, 27 cars were employed, dispensing with 9 section gangs and lengthening the sections from 8 to approximately 12 miles per section, an increase of about one-third. Results attained so far indicate a saving and more efficient service in every respect. Although opposed at first, the foremen are now greatly in favor of their use.

An increase in pay much encouraged the men and brought out their best efforts. Foremen are expected to keep cars and machinery in good order on their own time, looking after the machinery and knowing that it is in proper working order before going out on their sections in the morning.

We find that one of the most necessary requirements for successful operation is for the roadmasters to study the mechanism and to be prepared to instruct the foremen. Roadmasters and section foremen in a short time become so conversant with the operation of a car that they are able to take care of it at all times and overcome trouble without calling on our experts.

Since the beginning, the per cent of delays altogether, including breakage of chains to flooded carbureters, etc., has amounted to only 0.4 per cent. This is more than offset by the time gained over the old method of transportation. We figured before putting the cars into service that at least one hour per day per man would be gain in time alone. The actual service quite clearly demonstrates that this was a very conservative estimate and that the gain is nearer an hour and 20 minutes per man per day.

At first a daily report from the section foremen of the service was required, showing the section number, location, foreman, miles run, gasolene used, valve oil used and delays. Later on this was made a weekly, and finally a monthly report. Reports received so far indicate that the cars are making at the rate of 29 miles per gallon of gasolene and about 80 miles per pint of valve oil.

At first the instruction of the men was done by the agents of the manufacturers, who remained with each foreman for a few hours, but not long enough to cover all or even a small portion of the points necessary to a full understanding of the cars, hence the necessity for foremen and roadmasters giving the matter careful study.

It was thought that there might be danger attendant upon the operation of these cars, especially on a fast traffic line like the Illinois division. In order to reduce this element a bulletin was issued instructing enginemen to sound one long blast of the whistle when running against the current of the traffic, and in addition the roadmasters instructed section foremen that the average speed should not exceed 10 to 12 miles per hour, and a speed limit of 20 miles per hour on straight track was ordered. In addition enginemen were advised that the chance of accident would be greatly reduced if the instructions in regard to sounding the whistle for all crossings and obscure places were complied with literally. Section foremen were also instructed that no matter in what direction they were traveling, at obscure places or against the current of traffic, on double track they must handle the car so that accidents would not occur. It has been demonstrated that a car moving at 25 miles per hour can be stopped in 45 ft.; and at 30 miles per hour in 60 ft. Two men can remove a car from the track without trouble and expeditiously.

At first the cars were not furnished with any tools. We found that if section foremen were furnished with a certain number of appliances it would minimize delays and upon our recommendation, 1 spark plug wrench, 1 socket wrench, 1 monkey wrench (small), 1 pair pliers, 1 screwdriver, 1 gas plier, 1 small squirt can, 1 ammeter for testing batteries, 1 extra mica spark plug, 1 small coil spring and a piece of chamois skin for straining the oil were ordered for each section. It is also recommended that roadmasters carry a stock of supplies, such as batteries, spark plugs, etc., and that requisitions be made on them by section foremen for such articles as require too much time to get in the usual manner by requisition. Each foreman was furnished with a list showing the various parts of the machinery. The ammeter is very essential, as if foremen do not have this, batteries are likely to be thrown away long before they are entirely exhausted.

Wherever sections are located at or near pumping stations operated by gasolene power they receive their supply from those sources. For the balance, 60-gal. iron tanks are located at certain places along the division, where as many foremen as consistent can be supplied. These cans are kept filled by the oil companies who run wagons through the country. Tickets in triplicate are furnished for such supplies and handled through the agent, and the purchasing agent's office.

To facilitate train movement after severe rain storms or when trackmen are to go over the line preceding trains after a storm, instructions were issued to various foremen, telling them what portion of the division to cover. For instance, if one section extended both ways from a telegraph station, instead of covering such sections much time would be saved by running direct from one station to the next, and this plan was adopted. Thus we get very quick reports from foremen. One night recently, during a severe rain storm extending from Chicago to Savanna, just before important passenger trains were due, the entire division was patroled and inspected in 30 min., and delays to passenger service on that particular night were nominal.

With the old handcar it took the section crew at Savanna one hour to go four miles eastward up grade. The distance is now covered in 15 min. It is expected with the present power that these cars will handle 10 men and a push car ahead with several men on it everywhere except on heavy grades. The cars will accommodate 14 men without tools, and 10 men with all tools.

These cars are equipped with 7½-hp. twin cylinder engines, 4 in. in diameter, of 5½-in. stroke, and a driving range between three miles and 30 miles per hour. The arrangement of the cars is such that the engine can be reversed without the use of any special device. At night in order to prevent cars being disturbed by outside persons the foremen remove what is known as the commutator bar. This is but the work of a moment and prevents anyone, no matter how expert, from running the car. During rainy weather unless the vibrators are covered the operation of the car will be affected, but if the foremen will merely cover those parts with a rubber coat or canvas the trouble is nicely overcome.

It is found that a foreman can inspect track very much better with the new cars than with the old, because of being able to give the track his entire attention. During dry weather,

*Abstracted from C. M. & St. P. Employees Magazine, August, 1915.

damage done by fire is greatly decreased because of the facilities with which the men can reach a fire after it has started.

The supervision of the entire motor car service on all divisions is under C. B. Skelton, motor car inspector, Milwaukee shops. Many delays will be avoided if the following suggestions relating to the care of cars suggested by Mr. Skelton are adopted:

See that the working parts of engines are kept clean at all times, especially the timer, contact points, chains, spark plugs, valves and piston rings. The latter may be cleaned easily by using kerosene in the engines. In addition, see that all wires are fastened securely at the terminals and that insulation is in good shape.

A great many times a foreman will have the spark plugs cleaned and will not test them before having them replaced in the cylinders. This should always be done. There is but one way to test a plug properly, viz., attach the plug to high tension cable, laying the plug on some part of the engine so that only the threads are on the switch and move the car so the right contact is made, working the spark coil vibrator which leads to the plug being tested, then see that the spark jumps across the gap between the two points on the plug.

If a spark is not perceptible something is wrong. Either the plug is grounded through the porcelain member or insulation, or possibly the current is jumping through the wiring at some point and not reaching the plug. In a case of this kind another plug should be tried, to make sure just where the trouble lies.

Spark coil boxes should be protected from rain and snow by covering them with oil-cloth or some other covering that will keep the moisture out.

Spark coils are often damaged by connecting up too many batteries to the coil. Most coils are built for six volts on the battery circuit, or the equivalent of four cells when batteries are new, and if more batteries are added, the voltage runs over six volts, not only wearing out the vibrator points very rapidly, but very often burning coil insulation, putting it out of service.

When coils become worn out or it is found that they do not work properly, foremen should not undertake to make the repairs themselves, as these instruments are very delicate, but should send the coils to the general storekeeper, under registered baggage for repairs, and in each case the roadmaster should make requisition for the repairs and show the registered tag number on the requisition.

Carburetors should also be handled in this way, and should never be shipped to the general storekeeper by freight, for these parts cost considerable money and are often lost or stolen when shipped in this way. Under no circumstances should foremen keep extra spark coils or carburetors in tool houses for emergencies, but on receipt of a new carburetor coil should immediately ship the old one to the general storekeeper under registered baggage and advise him so he will know where it is from.

When it is found necessary to order new parts for motor cars, the foreman should first go through his catalogue and obtain the correct symbol number of the part he desires, then advise the roadmaster the part number of the motor car. If foremen will follow these instructions, it will save the storekeeper and others a great deal of trouble and will eliminate a great many delays which are caused by the wrong part being ordered.

A CORRECTION

In describing the method of laying rail with locomotive cranes on the Lehigh Valley, in the issue of August 20, the statement was made that 4.7 track miles of rail was relaid on the Buffalo division. This should have read 4.07 track miles on the Seneca division.

A CONTINUOUS RAIL CROSSING

The Hollinger & Daily continuous rail crossing, as its name designates, is a new device to provide a continuous rail at crossings. As applied to the crossing of two railroads, the rails are made continuous for whichever track is given the crossing, while the rails of the other tracks are broken to provide the necessary flangeway. For the crossing of an electric line and a steam line, the steam line tracks are not broken, but the rails of the electric line are made to form a temporary continuous line over the top of the steam road rails whenever it is necessary to pass any electric trains.

For the crossing of two steam railroads the rails of each track are cut off outside of the crossing a sufficient distance to permit the rails of the other track with full bases to pass by in front of them, as shown in the accompanying photograph. Between these cut ends, each rail is replaced by a combination of a stock and split rail designed to line up when their butt ends are in contact with the cut ends of the track rails, thus making continuous rails over the crossing. The stock and split rails are also arranged to pass by each other so that their butt ends may be drawn away from the cut rails a sufficient distance to permit the stock and split rails of the other track to be brought up in line behind them. All four sets of stock and split rails are operated by levers arranged to line up either set while the other set is drawn in to clear.

The arrangement for the crossing of a steam line and an electric line is similar, except that the steam line rails are left undisturbed while the electric line rails are raised sufficiently to bring the under side of their heads even with the top of the

Continuous Crossing for Two Steam Roads

steam line rails, the electric line rails being cut to fit the contour of the outside of the head and web of the steam rail, while the head of the former is cut back a sufficient distance to give the standard clearance for the wheel treads of steam line equipment. Inside of the crossing the electric line is provided with a stock and split rail combination, placed so that the tops of the rails are normally at a level with the tops of the steam line rails. An inclined plane is provided adjacent to the railroad rails, so that when the stock and split rails of the electric line are backed into position their butt ends are raised to the level of the electric line rail outside, these butt ends being cut to fit the inside of the web and head of the steam road rails and the head extending a sufficient amount to pass entirely over the latter and join with the head of the electric line rail outside.

In place of an interlocking plant the operating lever may be connected directly to a derail on the electric line, while, as a protection for the steam road, the operating lever may be enclosed in a cabin, so arranged that the lever cannot be moved from the position giving clear track for the steam line without closing and locking the door. Thus the motorman or conductor of the electric car is locked in until he again clears the track for the steam line.

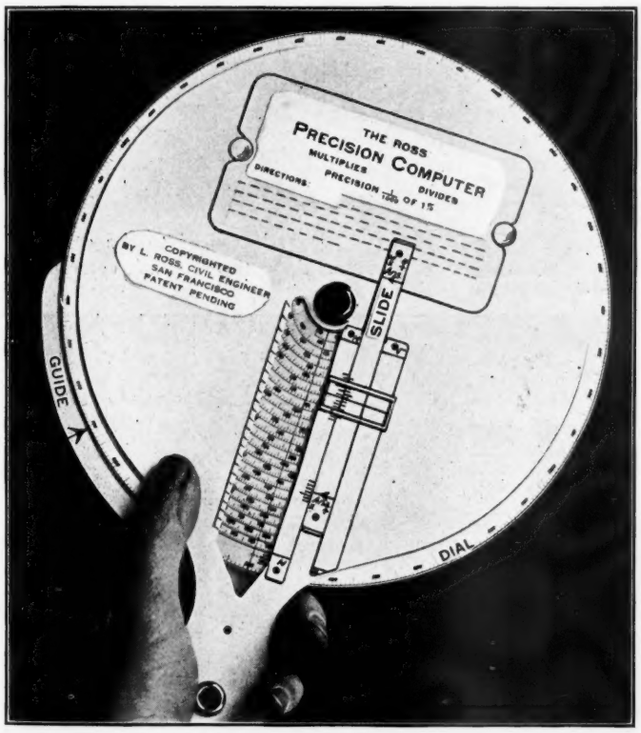
A crossing of the type suitable for two steam lines was in use on the Wheeling & Lake Erie for 21 months under a traffic amounting to 25 or 30 movements in 24 hours. During this time the crossing was subjected to very severe treatment, includ-

ing the running of cars over, with the crossing set for use in the other direction. Another rigid test was given it by placing a heavy locomotive on the crossing, so that one pair of driving wheels would be directly over the center. The brakes on its train were then set, cutting out driving brakes, and the engine was slipped in an effort to dislodge or move the slip rails. These tests are said to have caused no serious injury to the crossing. The crossings are manufactured by the Canton Frog & Crossing Company, Canton, Ohio.

A NEW FIVE-PLACE COMPUTER

A new calculator for engineers, which gives results to an accuracy of five significant figures, has been placed on the market recently. The length of the scale is 120 times as great as that of the A and B scales in the ordinary 10-in. slide-rule, and the system of graduations is uniform throughout. Provision is made also for obtaining approximate results, directly and simply, where that accuracy is sufficient.

This calculation, too, is known as the Ross Precision Computer, and consists of a graduated dial rotating under a slotted cover, a floating guide and a slide mounted at the right of the slot. The slide carries a miniature of the dial scale, and may be used alone to obtain an accuracy of three figures; it



The Ross Precision Computer

co-operates with the dial to check and point out the precise answer, and to locate its decimal point.

To multiply and divide any series of numbers it is only necessary to set each number in succession under the reading line in the slot; the answer is then read, also under the slot-line. The manipulations for setting the given numbers on the dial are simple; concise directions are given on the face of the computer.

It may be used to read five-place logarithms and anti-logarithms of all numbers directly. Powers, roots and other complex operations may be carried out either approximately, or to a higher degree of precision, as desired. Trigonometric calculations made by the computer give an accuracy of from 3 to 5 seconds of arc.

The Precision Computer is made of metal throughout; the graduations are engraved on silvered metal surfaces, and it is packed in a flexible case. It was invented by Louis Ross, and is manufactured by the Computer Manufacturing Company, San Francisco.

RESULTS GAINED WITH A BALLAST DRESSER

The Cafferty & Markle ballast dresser, described briefly in the *Railway Age Gazette* of February 21, 1913, has been used for some time on the Santa Fe with encouraging results. The spreader is essentially a plow suspended on the under side of a flat car. A middle portion 8 ft. wide is provided with notches where it crosses the rail to permit the lower edge to extend down almost to the top of the ties. Two wings extending

The Car Ready for Transit with the Plow and Middle Portion of Dresser Drawn Up and the Wings Raised

4 ft. beyond the ends of the ties are equipped with movable plates to permit adjustment to the contour of the desired ballast cross-section. The middle portion is raised or lowered by means of rods connected to air cylinders located directly above on the car platform. The wings are also connected to the cylinders by a train of levers and bell-cranks such that the travel of the cylinders necessary to raise the middle part clear of the rails will swing the wings up over the top of the car. Thus they are disposed of conveniently when not in use.

It will be seen in the accompanying photographs that an ordinary plow is used in conjunction with the spreader. It is not necessary to use the plow, but the spreader in question was

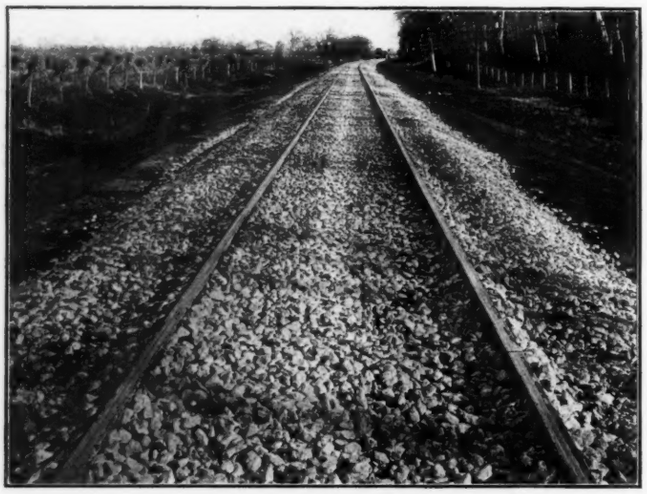
The Ballast Dresser and Sprinkler in Operation

so equipped originally, and it was found that the combination was very desirable.

When ballast is unloaded for track surfacing, it is not desired that it be removed to a greater extent than is necessary to render the track safely passable, and there is, therefore, no occasion to use the spreader. However, where track is ready for dressing, and only sufficient rock is to be unloaded to do this, the plow can be used to advantage to level off the ballast above the surface of the rails. As it is effective in disposing of most of

it and decreasing the stress on the spreading board, it is also an important auxiliary for the reason that it renders it possible to spread ballast over grade crossings, cattle guards, guard rails and switches, where it is necessary to raise the spreader to clear such obstructions.

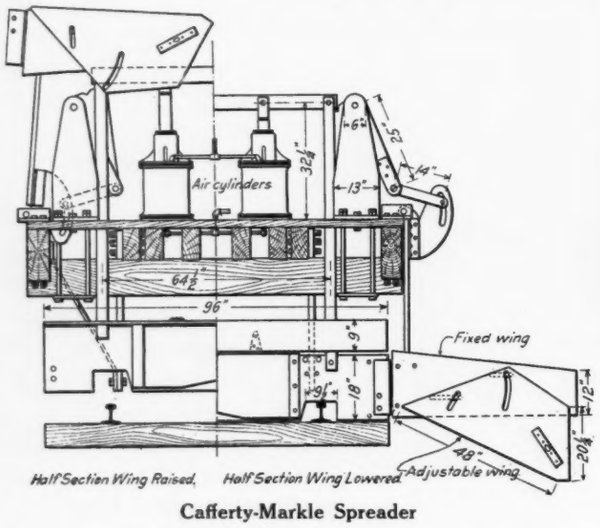
One photograph shows the spreading board pushing an accumulation of rock, of approximately 2½ cu. yd., which has been gathered from between the rails, and is being worked outward on each side of the plow. The ballast thus pushed along drops into sags in the shoulder where there is a deficiency of dressing material, thereby eliminating the necessity of performing the



Appearance of the Track After the Dresser Has Gone By

work by hand labor. The principal function of the wings is to shape the rock forced out by the spreading board into shoulder formation. This occurs simultaneously with the ejection of the ballast by the spreading board. The economy of this feature is determined by the fact that were an ordinary plow utilized it would be necessary to form the shoulder with hand labor.

In dressing ballast on double track it is merely necessary to adjust the wings to obtain the desired result. On curves where the sub-grade is canted to correspond with the elevation of



Cafferty-Markle Spreader

the track no difficulty is encountered because of the wings digging into the sub-grade, but where the sub-grade is not in conformity with the elevation, the difficulty can be easily overcome by adjustment of the wings.

A train consisting of 22 cars and carrying approximately 1,000 yd. of ballast was unloaded and spread in 48 min., leaving it as shown in the photograph of the track. It will be noted that the shoulder was fairly regular at the toe and that there was very little rock scattered. A gang of 17 men following the ballast dresser was able to dress the track to required form. This would ordinarily have taken at least 50 men. The results to be obtained in gravel are said to be even better than in rock.

The water tank seen in the photographs was installed primarily for the purpose of loading down the forward end of the car while the dresser was in use. At a later period it was developed into a device to sprinkle the ballast as the dresser passed over it. This is especially desirable on gravel ballast, as it eliminates a source of annoyance that almost always occurs in this work. The capacity of the tank is 4,000 gal., although 2,000 gal. is sufficient to sprinkle 1,000 cu. yd. of ballast. When the car is in transit the tank should never be more than half full. To obtain the best results in spreading, the ballast dresser should not be moved at a speed to exceed five miles per hour. The track on which the work referred to in this article was performed parallels the Kaw river, where there are numerous curves, many of which have considerable elevation, and many cuts and fills. We are indebted for the above information to R. J. Parker, general superintendent, Atchison, Topeka & Santa Fe, Topeka, Kan., under whose direction this spreader has been used.

A NEW STEEL TIE

A new steel tie is being put on the market by the Standard Steel Tie Company, Dallas, Tex. It consists of a rolled channel section ⅜ in. thick, 8 in. wide and 5 in. deep, and 8 ft. long, placed in the ballast trough side up with creosoted wood bearing blocks 7¼ in. by 7 in. by 18 in., each secured in place in the trough of the channel by two ¾-in. bolts and a 2-in. by 2-in. lug, sheared from the web of the channel and bent up to bear against the block. Four holes 2½ in. in diameter punched in the bottom of the tie near the center provide drainage and hold it in line.

Since the rail is supported on and secured to the creosoted blocks, the manner of handling these ties in track corresponds

Standard Steel Ties in the Pennsylvania Tracks Near Parkesburg, Pa.

very closely to the operation with the ordinary ties. They permit shimming, change of rail base and gage, and any ordinary track fastenings may be used. Since there is no metal connection between the rail and the channel, perfect insulation is afforded. Furthermore, the blocks, being 18 in. long and firmly secured in the channel, reinforce the tie under the rail where it has to meet the heaviest stresses.

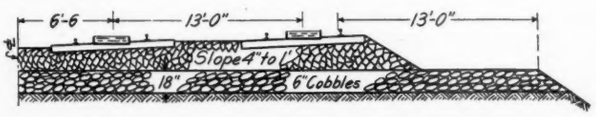
A number of these ties were put in the tracks of the Pittsburgh & Lake Erie, near Pittsburgh, a year ago, and others have been recently installed in the Pennsylvania Railroad tracks near Parkesburg, Pa., as shown in the accompanying photograph.

PUTTING IN SERVICE A NEW LINE WITH DENSE TRAFFIC

By W. F. RENCH
Supervisor, Pennsylvania Railroad, Perryville, Md.

It is the rule for restricted operation to continue upon new lines of road for many months after service is begun. This is, of course, an entirely proper precaution during the time the roadbed is becoming fully settled; but the interference with passenger and freight schedules, especially upon lines of intensive operation, renders desirable the early removal of this restriction. The trend of modern practice in making up time tables is to use the highest rate of speed consistent with safe movement, and schedules, once established, must be maintained thereafter. It has heretofore been considered that an extended period of slow passage over new work was a necessary evil imposed by safety considerations; but upon a careful study of the question it will be found that the required period may be greatly shortened without any risk being incurred. This cannot better be shown than by a careful analysis of a concrete example; the Bristol new line of the Pennsylvania between Philadelphia and New York.

Although the fill averaged 22 ft. in height for more than three miles, service was inaugurated at a speed of 30 miles per hour which was increased after 36 hours to 50 miles per hour, and after one month to 70 miles per hour. The operation of connecting up this new four-track line presented incidental points of interest which will be sketched briefly. The new line lies to the north of the old one, and No. 4 is the most northerly



Section Through New Embankment Under Track Tanks

of the tracks. The longest interval between scheduled trains in any daylight hour at this point was 35 min., and it was necessary as a preliminary to connecting up each track to draw it as closely to the existing tracks as possible. This effected a great saving in time not only because there was less track to be shifted, but the maximum lateral throw was greatly reduced.

In order to establish complete unity of action at the two ends of the work, which were separated about 3½ miles, a telephone line was installed having besides these two connections only one other which communicated with the signalmen at the nearest cabin. When it is known that the necessary extension of No. 1 track at the west end was 1,500 ft. and that the extreme depth of fill necessary in building it was 4 ft., it will be seen that unfailing execution of the prearranged plan was essential, and this required close co-operation between the operating department and the track forces.

The new passenger station was a mile distant from the old one, and as will be inferred readily, the operating impracticability of having a separate station for the eastward and westward travel was avoided by using No. 3 westward freight track for such eastward passenger trains as were scheduled to stop at this station, these being run against the current of traffic by train order.

There was nothing in the construction of the road to cause its early settlement excepting that the material of the fill was a homogeneous gravel and that the various features of the work were performed with the utmost fidelity. The filling was not deposited in layers, but was dumped from trestles built to the height of the sub-grade. The tracks were back filled with stone, but the cushion beneath the ties was no deeper than 2 in.

The maintenance question was greatly complicated by the presence at the point of highest fill of track tanks 1,600 ft. long in the four main tracks, which were on a 30 min. curve with 2 in. superelevation. The care of this feature formed one of the important elements of the solution. It is a well known fact that given a set of men used to daily manipulation of a locomotive at high speed there will be many who will violate the rules for reduction at specified points. This is particularly true at places where speed restriction is laid on account of scooping water. If high speed is used while this occurs there necessarily results a large waste of water, and careful observation showed that engine tanks were being overflowed frequently through one-third the length of the track tanks. The considerable volume of water that entered the roadbed through this practice introduced a grave element of danger to the stability of the new embankment. This was early recognized and partly met by a general notice limiting the conditions under which engines might take water at that station. But there still remained a rather heavy burden, and to meet this a special construction had been adopted for the subbed at the tanks and an extremely generous width of embankment was also provided. The former consisted of a carefully laid bed of cobbles 18 in. deep beneath the entire sub-grade throughout the length of the tanks, and for 400 ft. either way from the ends which alone cost the sum of $15,000. The widening which was done with the heaviest material obtainable, principally dirt from the cleaning of the center ditches and containing much old ballast, extended the shoulders on both sides to a distance of 13 ft. from the gage of the rail. This construction has also been followed in other similar installations. A cross-section of the roadway is introduced as information concerning a quite effective practise.

There were nine bridges throughout the extent of the deepest fill, which limited the amount the track might safely be allowed to settle. Without the presence of these structures it would have been permissible to assign only a sufficient force to the maintenance that safe and comfortable passage at moderate speed required. But the subsidence had to be met daily as it occurred. The settlement during the night amounted to no more than 2 in., and through the cantilever support provided at the ends of the several bridges by both the service rails and the iron guard rails there was always a comfortable run-off. The total settlement of the tracks was attained at the end of six months and amounted to 18 in. The wisdom of having placed this new line in stone ballast at the start was therein fully shown since the standard depth of stone ballast was thus naturally secured.

There was assigned to the maintenance of this new railroad a force of 450 men, and this force was continued during the first ten days of service. The cost was thus $8,000 for lining and surfacing a three-mile stretch of road for this short period. The force was gradually reduced as the embankment was compacted, and on January 1 a regular progressive decline in maintenance began. The excess cost of lining and surfacing in January was $2,500, and this diminished uniformly $500 per month thereafter until on June 1 the expense of maintenance was on a par with that of other main tracks.

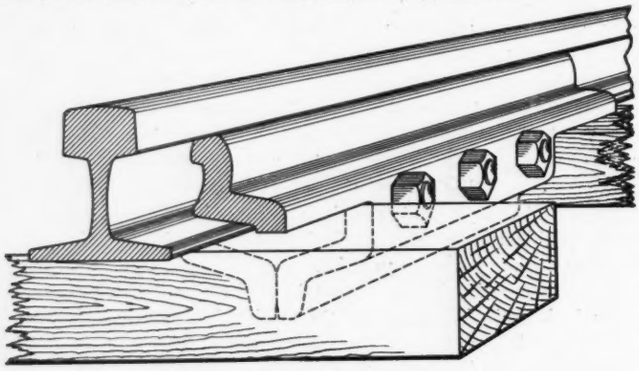
The pertinent fact developed by this somewhat unusual case is that the plentiful labor expended upon the maintenance in the early period of its use greatly hastened the final settlement of the new roadbed. In any construction a definite amount of settlement is inevitable, and as track stresses are known to be higher at fast speed it unquestionably is an advantage to fix the speed as high as practicable and then provide the necessary force to safely maintain the road. The benefit derived from an early establishing of full service upon this line of road, which carries a daily traffic of more than 200 trains, fully justified the considerable expense that was necessary to attain it.

THE PEAT DEPOSITS OF RUSSIA.—The area covered by peat deposits in Russia is about 177,000 square miles. The deposits belonging to the government have been examined and are found to run about 260,000 cu. ft. per acre, equivalent to 2,300 tons air-dried. If the same ratio holds over the country as for the government lands, the total reserve is about 100,000 million tons of peat. This compares with coal reserves of about 80,000 million tons. The peat is constantly growing, and taking its heating value at half that of coal, it is evident that the peat reserves are about equal to those of coal. Around Petrograd half of the country is covered with peat bogs.

AN EMERGENCY RAIL JOINT

An emergency rail joint has been recently developed and placed in service for emergency use on the Pennsylvania Railroad. In general it consists of two heavy splice bars with depending flanges which are provided with three bolt holes so placed that the two bars may be connected by bolts passing underneath the base of rail. The two flanges come to bearing below the bolts and the fulcrum thus afforded makes it possible to bring the bars to tight bearing against the rail by tightening the bolts. By this device two rails may therefore be held together for a time with reasonable security without the necessity for drilling bolt holes through the web.

One purpose for which this joint is designed is the quick relief in the case of a broken rail, which can be reinforced with this



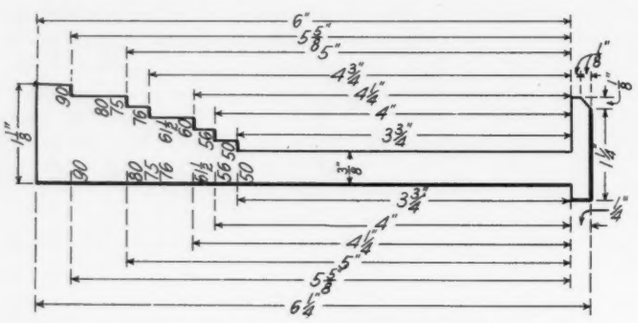
An Emergency Rail Joint Devised for Use on the Pennsylvania Railroad.

device without taking time to drill holes. A second use is to facilitate the replacing of rails in main running tracks. Frequently after several new lengths of rails have been spliced together and shifted into the opening made by removing the old rails, trouble is experienced in lining up the bolt holes in the splices at each end. In such a case the emergency splice would enable a firm, temporary joint to be secured quickly to permit the passage of trains.

The joints are made in lengths varying from 10 to 30 in., the shorter lengths not extending over the cross ties. The weight varies from 40 to 80 lbs. per pair, according to size. This joint was designed by Edwin W. Hankele, of the engineering department of the Pennsylvania Railroad, Pittsburgh.

A RAIL SCALE

The rail scale illustrated in the accompanying drawing is used on Morgan's Louisiana & Texas Railroad. The scale is cut out of brass 1/16 in. thick, notched at one side for the height of the various sections of rails used on that road and graduated on the



Rail Scale Made of 1-8 Inch Brass

opposite side for the width of the base of the rails. We are indebted to W. E. Mielly, assistant engineer, Louisiana Lines, Southern Pacific.

ANOTHER VIEW OF THE SECTION FOREMAN PROBLEM

By J. T. Bowser

Maintenance of Way Department, Queen & Crescent, Danville, Ky.

Much has been said and written in the last few years about the increasing difficulty of obtaining capable section foremen, perhaps to the neglect of the question of retaining the men we have at present and getting the best results from them. Men with years of experience are dropping from the ranks for one cause or another, and others are being discharged on account of unsatisfactory service. Can not some of the conditions be remedied which cause these men to resign or to become incompetent? Many a good foreman is lost to the service on account of the lack of proper treatment, proper understanding or appreciation. Many a foreman is discharged for incompetence or for other causes who would give entirely satisfactory service under more favorable conditions.

Section foremen, as much as anyone else, are appreciative of personal interest. A little judicious praise by a road supervisor or division officer, a comment on a favorable showing made along some particular line, are just as necessary to secure the proper results as reproof and condemnation for errors or inattention to business. Many men are not located on sections to which they are best suited. Conditions under which some men thrive and do their best work are fatal to the efficiency of others. The man who is not making a good showing should not be "scrapped," with his years of experience, if his failure is due simply to the fact that he does not fit a certain condition. A man who fails on a difficult section may make a valuable man on an easier section. The sluggish, indifferent man on an easy section may require the difficulties and worries of a hard section to wake him up and bring out his real qualities. The difficulties that crush one man may be the incentive that another needs. It is often the case that the longer a foreman stays on one section, the more efficient he becomes, but it is true perhaps oftener that he gets into the rut of the same conditions, the same old soft spots, the same old curves, and his best service is lost. Nothing kills initiative and promotes dissatisfaction like the monotony of routine.

A good man is often lost to the service because he must give consideration to the needs of his family. The schools at the point at which he must live may not be what he wants for his children; or their health may not be good in a certain locality. If he were changed to a section where better conditions could be found, his appreciation would show itself in better service. Certainly a man will do better work if he is satisfied that he is doing his best for his family. A fruitful source of trouble that may be eliminated is the foreman's loss of control over his men through familiarity with them. This error should be pointed out to him and, as a last resort, he should be changed to another location. He may avoid this trouble with a new set of men. Probably the most potent cause of poor work and of resignations is discouragement. There are some sections on which the best foreman could never take a premium. Year after year he may try his best and see it go to a less competent man more favorably situated. Men so located should be made to know that their difficulties are understood and that their efforts to make the best of them are thoroughly appreciated.

In short, consideration and intelligent personal interest will do much toward retaining and making effective the foremen we have, and to that extent will lessen the pressure of the need for new men.

PERUVIAN RAILWAY OCCUPIES HIGH POSITION.—The Central of Peru is said to cross the Andes at the highest point reached by any standard gage railroad in the world. One short branch reaches an altitude of 15,586 ft., which is higher than Mount Blanc, the highest of the Alps. The railroad cost $200,000 and the lives of 7,500 men.

Placing a Concrete Lining in the Sandy Ridge Tunnel

The Carolina, Clinchfield & Ohio Is Using an Efficient Plant, with a Hopper Car for a Pneumatic Mixer

The Carolina, Clinchfield & Ohio has recently completed and placed in operation that portion of its line known as the Elkhorn extension, thus extending the line from Dante, Va., to Elkhorn City, Ky., the terminus of the Big Sandy division of the Chesapeake & Ohio (described in the *Railway Age Gazette*, November 7, 1913). Where the above extension passes under the divide known as "Sandy Ridge," just north of Dante, Va., there is a tunnel 7,804 ft. long. This tunnel passes for about one-half its length through slate and shale formations, which disintegrate upon exposure to air, and for the remaining half through sandstone badly seamed and broken. In view of these conditions, it was decided to begin the lining of the entire tunnel with concrete at once. This work requires the placing of between 50,000 and 60,000 cu. yd. of concrete while traffic is passing through the tunnel.

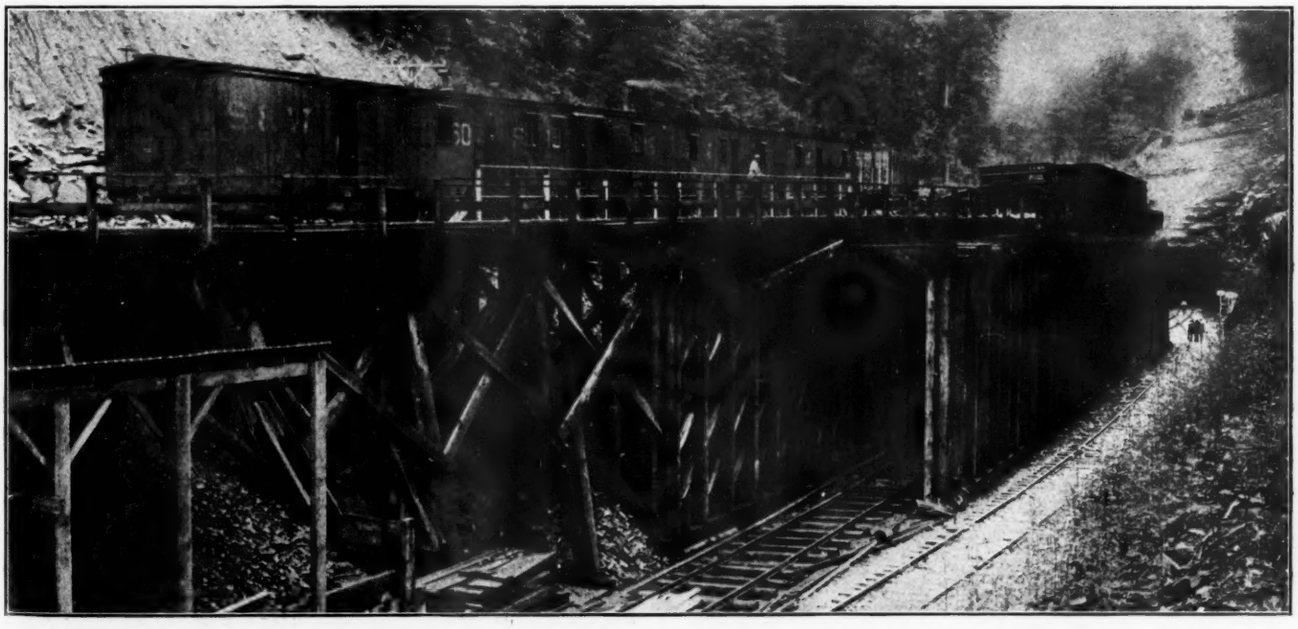
In addition to Sandy Ridge there are a number of other tunnels on the above extension as well as on other portions of the road which may require lining in the future under similar conditions of traffic. With this in mind the railway engineers made a special study of various plans for the above work by which it could be done with economy and rapidity, also holding in mind that much of the plant would be used for similar work after this particular job is finished.

The result of these studies was the determination to use the compressed-air method of mixing and placing the concrete, and to provide for this a plant consisting of a self-propelled concreting car, a loading and storage trestle, a compressed-air plant and pipe line through the tunnel and concrete forms, which are quickly and easily movable.

THE CONCRETE CAR

On account of the great length of the tunnel it was deemed impracticable to furnish the concrete from a mixer located at either portal of the tunnel, as too much time would be consumed in transporting the wet concrete. It was concluded at the outset that the mixing could be done inside the tunnel, where the concrete was to be deposited, and the conclusion was reached that a car carrying the ingredients would be the proper solution. It also appeared most desirable, if not absolutely necessary, to handle the car without filling the tunnel with smoke. These premises led to the idea of a self-propelled concreting car, and finally to the gasolene engine as most nearly fulfilling all conditions for the propelling device. A gasolene engine will emit only a small amount of smoke or gas while moving and can be shut off entirely when in position for use. It occupies but small space, can be operated by one man, and contrary to general belief, is very reliable. To obtain capacity, gravity flow of materials and a convenient and desirable arrangement, the car was made as large as the standard clearance of the road would permit after allowing room for concrete forms. The dimensions are 40 ft. long over end sills, 10 ft. 4½ in. wide over braces and 17 ft. 9 in. from top of rail to top of car. It was built of steel as the material bins are high above the rail and the weight is considerable

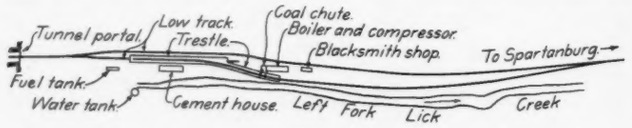
The principal features of the car, as shown in the accompanying drawing and photographs, are a central chamber, open on the sides, 8½ ft. long, 9 ft. 8 in. wide and 10 ft. 3 in. high, in which on one side is located the pneumatic concrete mixer and on the other side the charging skip. Over this chamber is a water tank of 1,850-gal. capacity, which furnishes water for the concrete and is also connected with the cooling system for the gasolene engine. On one end of the car facing the central chamber is a stone bin of 30 cu. yd. capacity. On the other is a sand bin of 12 cu. yd. capacity. Each bin has a chute 20 in. wide leading to the charging skip, and each chute is controlled by an under-cut gate. Under the stone bin is a space occupied by a 96 cu. ft. air receiver, standing vertically, and the storage of the cement in bags. Under the sand bin is the gasolene engine and its auxiliary equipment completely housed from water and dust. The charging skip in its lower position stands with its top rim about 1 ft. 3 in. above the floor and travels on inclined guide rails to its upper position over the mixer, being hoisted by a compressed-air cylinder 9¼ in. in diameter. The gate of the skip works automatically by



Loading and Storage Trestle from the South, with the Entrance to the Tunnel in the Background

means of a guide rail. The mixer is for a two-bag batch (0.4 cu. yd.) and has an 8-in. outlet pipe at the bottom running horizontally and curving to the outside of the rear truck, and thence vertically to near the top of the car, where it branches by means of a wye into two lines, one a 180-deg. bend to the rear for "shooting" into foundations and sidewalls, and the other going to the roof for "shooting" into the arch. The wye is a special patented device with a sliding plate controlling the movement of material into either arm. The arrangement of the pipe, traveling with the car and being in position at all times for "shooting" concrete, results in a material saving of time and expense.

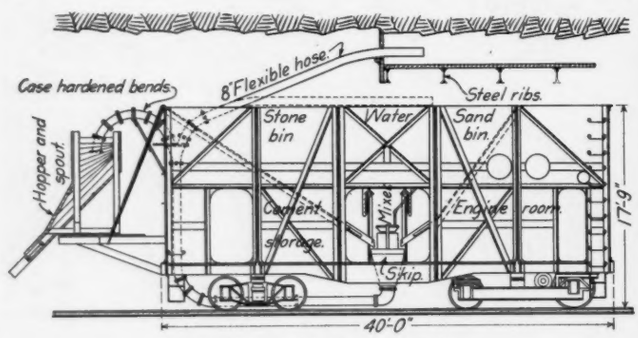
Along one side of the car, level with the main floors, is a folding platform 2 ft. wide, used by the men carrying cement and to gain access to the engine room. During the ordinary



Layout of Material Plant at the South Portal

work of the car this platform remains down. The entire arrangement is compact and arranged with a view to save manual labor. One man controls the hoisting of the skip, the injection of water and the mixing and discharge of the batch. One man is placed at each chute and two men carry, open and empty the cement bags.

The gasolene engine is of the six-cylinder, four-cycle tee-head type and is rated 200 hp. at 350 r. p. m. It can be throttled to 125 r. p. m. The motor and its frame constitute one of the trucks of the car. The cylinders stand in a row at right angles to the track and the whole construction is compact but accessible. The engine is started by admitting compressed air into three cylinders, then the explosion of the gasolene takes place in the other cylinders and continues the motion. The transmission is by means of a Morse chain on to the driven axle (one only being used) and the control is through a friction clutch of special design. The general principle employed is much the same as in the ordinary automobile. The car and gasolene en-



Elevation of the Concreting Car

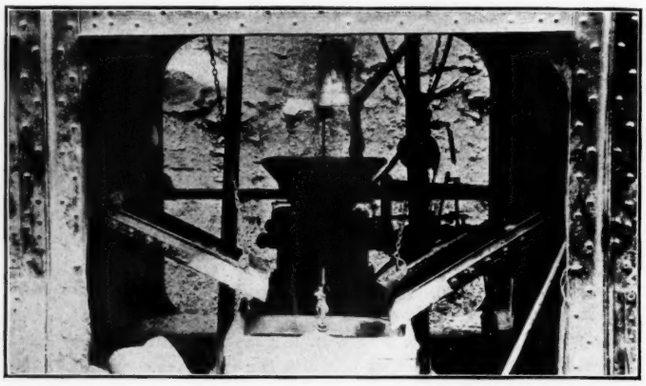
gine were built by the McKeen Motor Car Company, Omaha, Neb. It was sent knocked down, was erected at the railway shops at Erwin, Tenn., and was moved to the work (105 miles) under its own power at a speed at times as high as 25 miles an hour.

LOADING AND STORAGE TRESTLE

The loading and storage trestle is of special design and so arranged that the concrete car goes under it and receives crusher-run stone, sand, bag cement and water by gravity. The sand and stone is drawn from overhead bins by means of undercut gates. Cement is conveyed into the car by a chute. The trestle has a track over its deck upon which stone and sand in hopper cars are stored or unloaded into the bins below. There is a continuous row of 27 bins with an aggregate capacity of 324 cu. yd. and a total length of 162 ft., and five loaded cars can be stored over these bins to give an additional storage capacity of 200 cu. yd. The general arrangement is shown in the track layout and in two of the photographs.

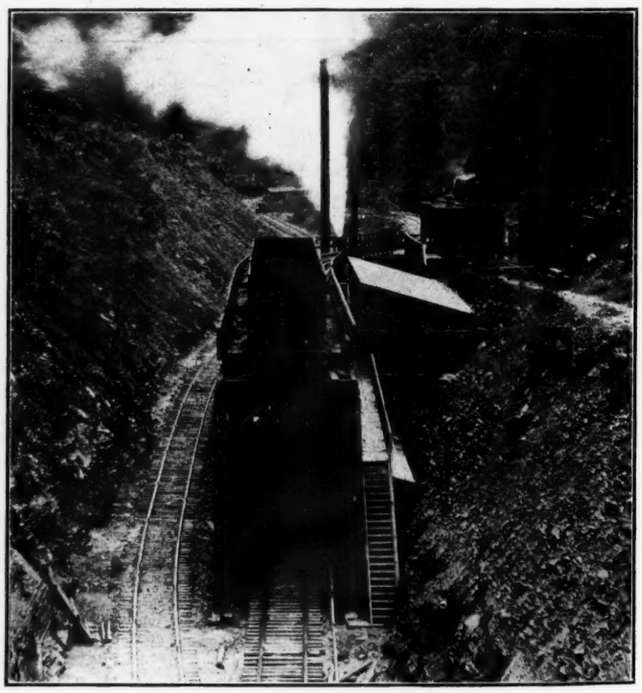
COMPRESSOR PLANT AND PIPE LINE

The compressor plant is exceptional for a temporary outfit. To save money on foundations and at the same time to increase the space, the floor level of the boilers and compressors was fixed 4½ ft. above sub-grade, the concrete foundations and walls were built up to this height and the cellular space under-



Central or Working Chamber of the Car Showing the Skip in the Foreground, the Mixer in the Rear and the Chutes on the Sides

neath was utilized for water tanks and ash pit. The building was built of 1-in. boards covered with tar paper. The arrangement chosen permits coal to be dumped from cars on the trestle to a pile in front of the boilers. There are two boilers, both locomotive type, one new, one of 150 hp., and one old one of 70 hp. The piping connections are such that either one can be cut in or out of service for cleaning or repairs. Two compressors are installed, but an extra foundation for another unit is provided, for reasons which appear elsewhere. The compres-



General View of Loading Trestle from the South Portal of the Tunnel

sors are alike and of the Ingersoll-Rand F. R. I. Rogler valve class, a high speed, single stage type with a steam cylinder 12 in. by 12 in., an air cylinder 12 in. by 14 in., a piston displacement at 250 r. p. m. equal to 528 cu. ft., an actual output of about 375 cu. ft. of free air per min. each. They work under 125 lb. steam pressure and compress air to 115 lb. They are

cooled by water brought by gravity from the mouth of an old coal mine. From the compressor a 6-in. pipe leads to a 150-cu. ft. air receiver, from which a 4-in. pipe line goes on a steady 0.5 per cent down grade entirely through the tunnel. At the lower end is a pet cock to draw off any water. In order to provide for expansion and contraction, the pipe line is laid alternately on the east and west sides of the track in lengths of about 1,000 ft. connected by curves of 2 ft. radius. The bottom of the pipe is at the level of the bottom of the ties and 1 ft. out from their end. About every 100 ft. a long radius tee is placed and about 20 mine cocks of 4-in. size are provided; these can be shifted to the various tees as the progress of the work demands. From the mine cock a 3-in. hose 60 ft. long connects with the 96-cu. ft. air receiver on the car, which can thus be connected to the 4-in. pipe line from any position in the tunnel.

GENERAL

The forms are of steel except the arch ring, which is 3-in. hard pine on steel ribs. They are of the Blaw collapsible type, but of exceptionally stiff design. They are held by anchor bolts to the walls of the tunnel and are without interior bracing, so that the concreting car as well as trains may pass without interruption. They are collapsed by inserting temporary rods, which are removed when not in use. Five 30-ft. sections are provided, and it is expected that the car will fill at least one section each day and lose no time waiting for the moving of forms or for the concrete to take its set. For the foundations and initial bench wall, wooden forms are in use. They are made in sections of 12 ft., are braced from the track, and are taken down, carried ahead and reused as required.

The car began regular operation in the tunnel on July 9, 1915, and has worked every day since, Sundays excepted. It has steadily increased its output as the men become more used to the work and better organized, as shown by the following record:

Week ended July 17, 1915, 261 cu. yd.
Week ended July 24, 1915, 379 cu. yd.
Week ended July 31, 1915, 516 cu. yd.
Week ended Aug. 7, 1915, 822 cu. yd.
Week ended Aug. 14, 1915, 928 cu. yd.

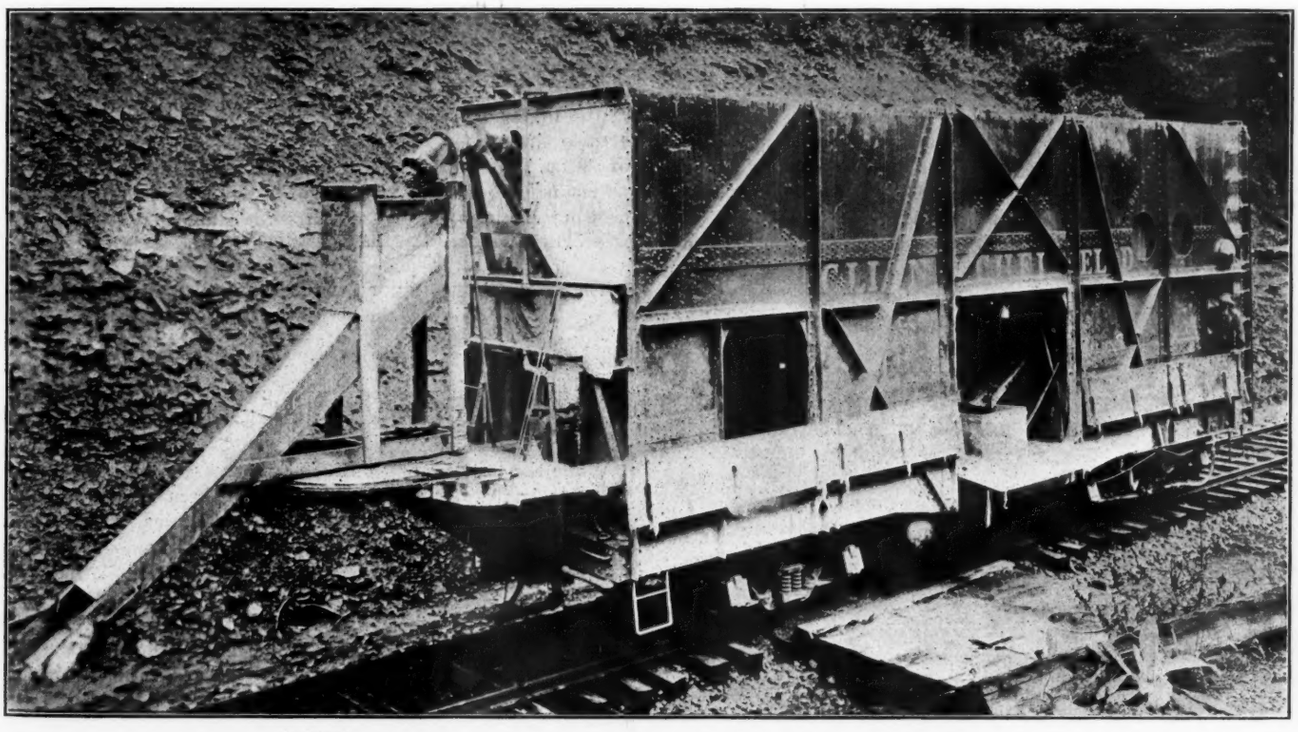
Several runs of 180 cu. yd. per day and one run of 201 cu. yd. have been made. The work so far has consisted of putting in the foundation and the initial lift of bench wall 4 ft. 4 in. high, which involves moving the car more than will be necessary when "shooting" into the arch form. The performance is, however, largely dependent upon interference from trains passing through the tunnel.

Another feature of this plant is the short pipe through which the charge moves. Generally speaking, it has been held that at least 50 ft. of pipe was necessary to get a good mixture of concrete. In this case it goes through 41 ft. of pipe and 10 ft. of chute and the mixture is good. In several installations concrete has been placed through 1,200 ft. of pipe and the record for distance to date is 2,805 ft. One of the difficult problems confronting the designer is to place the charges of ingredients into the mixer fast enough to work it to its capacity. The mixer can shoot a batch every 15 sec., provided sufficient air is furnished, but to give it a charge of material every 15 sec. seems to be an unsolved problem. Time records of the device given below show the speed at which batches are discharged, giving the actual time the car is coupled to the hose and working inside the tunnel:

Aug. 17, 1915, 423 batches in 381 min., average 54.0 sec. per batch.
Aug. 18, 1915, 323 batches in 302 min., average 56.1 sec. per batch.
Aug. 19, 1915, 448 batches in 340 min., average 45.5 sec. per batch.
Aug. 20, 1915, 325 batches in 250 min., average 46.1 sec. per batch.
Aug. 21, 1915, 309 batches in 280 min., average 54.3 sec. per batch.

The variation is due to the condition of the material, whether wet or dry, which affects the rapidity with which it flows in the chutes and skip. It is believed that the operation can be speeded up to an average of about 35 to 40 sec. per batch with dry material. One should observe that the door of the skip automatically opens as the skip reaches to position and closes as it is lowered away, also that the door serves as a chute while open, and that the side slopes are steep and unbroken, so that the skip clears quickly. The material when damp has a decided tendency to arch either vertically or horizontally, and frequently this arch must be broken by hand. The hoisting of the skip, the placing of the water and the discharge of the batch are all controlled by one operator. The inside of the car is lighted by carbide lights, and the outside work by hand torches and carbide lights.

A great diversity of opinion exists among those familiar with the compressed air method of mixing and placing concrete as



General View of the Concreting Car

to the quantities of air required. So far it appears that for the present plant a capacity of 750 cu. ft. of free air per min. is ample, but on account of this difference of opinion space has been provided in the compressor house for an extra compressor. It has been found that one compressor slowed the work down to a batch about every 1¼ min.

The plant was designed by O. K. Morgan, office engineer, under the general direction of Ward Crosby, chief engineer, of the C., C. & O., to whom we are indebted for the above.

BRIDGE AND BUILDING CONVENTION

The twenty-fifth annual convention of the American Railway Bridge and Building Association will be held at the Hotel Statler, Detroit, October 19-21. From present indications a large attendance is expected. Among the reports which will be presented are the following: Railway Water Tanks; Pile and Timber Trestle Bridges; The Protection of Grade Crossings; Coaling Stations; Costs of Structures; Efficient Methods of Handling Work and Men; Warnings for Overhead and Side Obstructions; Reinforced Concrete Bridge Work; Station Buildings for Passenger Service; Concrete Culvert Pipe and Concrete Piles.

The Bridge and Building Supply Men's Association is also planning a meeting and an exhibit at the same place coincident with this convention.

WATER SERVICE TESTS

By Paul M. La Bach.

Assistant Engineer, Chicago, Rock Island & Pacific, Chicago.

The customary unit of cost of pumping water for locomotive and similar uses is the cost per thousand gallons. While this unit is useful for many purposes, it has little value when one desires to compare the efficiency of one plant with that of another. The costs of the same plant may be compared from month to month, but even then, false conclusions may be drawn as the plants are apt to deteriorate with age, or the conditions may be altered. The most accurate way of comparing costs, exclusive of the pumper's wages, is by using the water horse power hour or some multiple thereof as a unit; the water horse power hour in this case being the overall horse power hour. This will not give the relative efficiency of each unit of the plant, but when once determined, plants of different design may be compared and tests made of the different parts at the same time.

Those responsible for the design of such plants are frequently called upon to decide which is the most economical, a steam plant with a direct-acting steamp pump, an oil engine, with a power pump, or a power pump with motor drive. About the only known quantity is the price of coal, oil or electric current. From this point the designer must work with percentages which are supposed to indicate average efficiencies for each of the different units, such as the boiler, pump, pipe line, etc. The present state of the art is such that not enough is known of the actual performances of these parts for anyone to form very accurate conclusions. There is great need for a series of plants, taken as a whole, which may also be divided into their component parts. This will bring out the points of good design and also show up many bad ones.

Probably one of the principal reasons why more tests are not made showing fuel consumption on a horse power hour basis is the popular impression that it is a complicated process requiring much time. If indicators are used and cards made this is relatively true, but even then it is worth the trouble. However, another method may be used which is sufficiently accurate for the purpose. All that is necessary is to install a water pressure gage in the discharge line at the pump, a vacuum gage in the suction line, and an automatic counter to record the number of revolutions of the pump. The fuel must be weighed or measured as the case may be.

All the data required is found by reading the two gages and the counter four times an hour and recording the amount of fuel used. These data are then utilized in the following formula:

$$\text{Water horse power} = \frac{P.\ L.\ A.\ N.}{33000}$$

P = Mean effective pressure in pounds per sq. in. in discharge line while working, plus the reading of the vacuum gage divided by 2.035, plus the vertical distance in feet between the vacuum and pressure gages multiplied by 0.434.

L = Length of stroke in feet *a*.

Multiply *a* by 1 for a single-acting simplex pump.
Multiply *a* by 2 for a double-acting simplex pump.
Multiply *a* by 2 for a single-acting duplex pump.
Multiply *a* by 4 for a double-acting duplex pump.
Multiply *a* by 3 for a single-acting triplex pump.
Multiply *a* by 6 for a double-acting triplex pump.

A = Area of piston in sq. in. This is the effective water area and the area of the piston rod should be subtracted.

N = Number of revolutions per minute.

In case it is difficult to install a vacuum gage take the difference in elevation between the water level at the suction end of the intake and the pressure gage, in feet, and multiply this by 0.434 This may be corrected for friction, but where the pipe is short it is not necessary.

A log for an hour's run will be as follows:

Pressure gage, 100 lb.
Vacuum gage, 10 in.
Revolutions, 2,400.
Pump, 6 in. by 12 in. triplex, single-acting. Area, 28.27 sq. in.
Difference in elevation between gages = 3 ft.
P = 100 × 4.9 + 1.3 = 106.2.
L = 3.0 ft.
A = 28.27 sq. in.
N = 40.

$$\frac{106.2 \times 3.0 \times 28.27 \times 40}{33000} = 10.91 \text{ water horse power.}$$

The amount of work done in 10 hours is 109 h.p. If 20 gal. of kerosene is used during the period the fuel efficiency is 0.192 gal. per water horse power hour. It will be noted that the taking of water from the storage tank by locomotives during the test does not introduce a number of unknown quantities. The pressure gage should be in view constantly and any changes in head recorded with the time.

While the test is going on it is sometimes of considerable interest to know just how much water has been put in the tank. Where possible tank measurements should be made in order to compare the displacement of the pump with the amount actually delivered. Any excessive slippage would indicate as a rule that the valves of the pump needed overhauling.

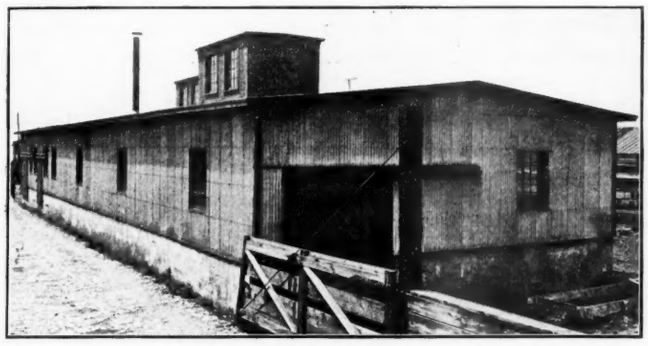
The importance of making actual tests under service conditions cannot be too strongly insisted upon. A variety of uses will be found for the data collected, which will lead to more economical operation.

Mr. Taft and the Railroads.—Mr. Taft says that we must grant increased rates to the railroads and do it quickly; that their prosperity is important to the prosperity of the country, because their expenditures create a very large part of the demand for our manufactured goods. He calls it outrageous injustice to make the railroads carry the enormous burden of the parcel post for nothing. He says the full-crew bills should be repealed because they impose the burden of employing unnecessary labor. The plight of the railroads today is largely due to Mr. Taft's action in 1910. He is fair enough to admit that he made a mistake. It was a terrible mistake, and has materially helped to keep the business of the country at low mark for five years. Mr. Taft should appear before the interstate commerce commissioners, the majority of whom he appointed, and who are still fumbling around in darkness.—*The Bache Review.*

CORRUGATED SHEET ASBESTOS CONCRETE

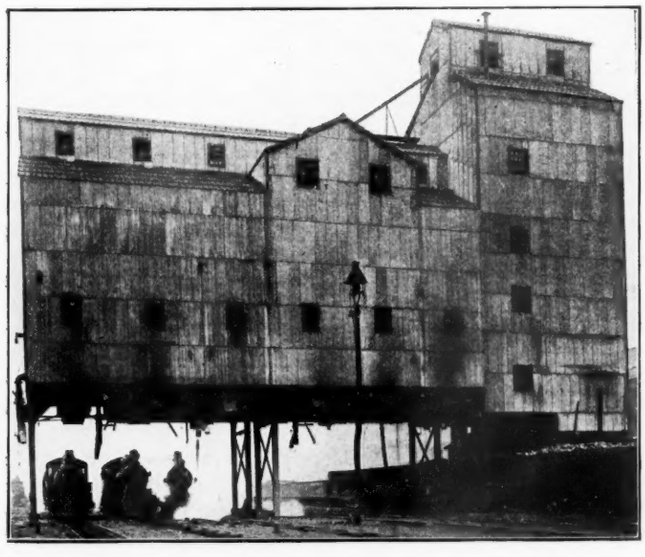
A building material of recent introduction is the Ambler corrugated roofing and sheathing, manufactured by the Keasbey & Mattison Company, Ambler, Pa. It consists of the combination of cement and asbestos fibers, known commonly as asbestos board, in the form of corrugated sheets, and is applied like corrugated iron. Its particular value is in its resistance to the action of air, water and temperature changes and its incombustibility. It possesses all the advantages of corrugated iron as to ease of erection, lightness and adaptability.

The incorporation of the asbestos fibers with the cement to form a dense, tough concrete, demands special treatment. The process may be described briefly as follows: Hydraulic cement



New York Central Sheep Sheds at Buffalo Covered with Corrugated Asbestos Sheets

is first mixed with water and asbestos fiber of the chrysolite variety, in a beating engine similar to that employed in the manufacture of paper pulp. The material then passes to the vat of a modified mill-board or paper machine, wherein it is kept in a state of agitation until picked up in thin coatings by a fine wire screen on a revolving cylinder, from which it is passed by an endless felt belt to a second rotating cylinder, upon



Corrugated Asbestos Sheets on the Coaling Station of the Terminal Railroad Association, St. Louis

which it accumulates in layers until the desired thickness has been attained. The material is then cut across and removed in the form of sheets which are piled one upon another and placed between corrugated metallic plates. The latter are then subjected to heavy pressure to compact the material, drive out excess water, eliminate all voids and fissures and give it the corrugated form, after which time is given for proper seasoning to allow for the setting of the cement.

Corrugated asbestos sheets for roofing and siding purposes are made of a uniform width of 27½ in., comprising eleven complete corrugations, and in lengths of 4, 5, 6, 7, 8, 9 and 10 ft. The corrugations are 2½ in. wide and 1 in. deep from top to bottom of corrugations. The material varies in thickness from 3/16 in. to 5/16 in. and weighs from 2.8 lb. to 3 lb. per sq. ft.

The best device for attaching roofing to steel and iron frame work has been found to be aluminum tie wires. Two holes are drilled through the asbestos, one just above and one just below the purlin. The outer end of each tie wire is provided with a head similar to that of a wire nail and holds a soft lead washer. The inner ends of the two wires are then twisted together around the purlin. In applying the material to wooden purlins, wire nails with lead washers take the place of the aluminum tie wires just described. The fastening for siding consists of a galvanized iron clip, bent so that the inner end rests over the purlin or other horizontal iron support. The clip is fastened to the corrugated material by two ¼-in. stove bolts. The siding is secured to the wooden frame work by means of nails, as in the case of roofing. For the protection of corners and ridges, rolls of the same material as the roofing and siding are used.

This material is used as a substitute for corrugated iron on railroad buildings, as illustrated in the accompanying photographs.

TIE PRESERVATION*

By F. J. ANGIER

Superintendent Timber Preservation, Baltimore & Ohio, Baltimore, Md.

On the Baltimore & Ohio, ties cost $121 per mile of track maintained in 1904. By 1912 this cost had increased 70 per cent and in 1913 109 per cent. In other words, the cost of the ties in a mile of track had more than doubled in less than ten years. The amount of money involved is large, for next to fuel, ties constitute the largest single item of material cost on the railroad. The amount spent on the Baltimore & Ohio for ties in 1913 was over $2,200,000. This does not include ties for construction work, or the cost of labor putting them in track.

In the campaign for the conservation of the nation's resources, the railroads can materially assist because the cheaper, inferior and more plentiful woods, such as red oak, beech, elm, etc., can be so protected by treatment to last as long as, or longer in some locations, than the best white oak. This makes it feasible to use woods otherwise not easily marketable, and prolongs the existence of white oak timber, a species which, if there were no tie-treating plants, would soon cease to exist, resulting in loss to those trades that use it.

Further, this movement which encourages the purchase of beech, maple, elm and the inferior oaks, opens up a market for such timber along the tracks of the Baltimore & Ohio, which will bring millions of dollars into circulation among persons who in turn will spend a portion of this money with this railroad for the transportation of merchandise and passengers.

The wood preserving industry in the United States has been built up largely on crossties and other railroad material. In 1913, out of a total of approximately 150,000,000 cu. ft. of wood treated, nearly 80 per cent was railroad ties, and probably another 10 per cent other railroad material.

While nearly 30 per cent of all crossties used annually received a preservative treatment, less than one-half of one per cent of the total consumption of manufactured lumber is treated. Future developments should be in the direction of more extensive treatment of all timber exposed to decay. If the crossties and the ten billion feet of lumber which fail from decay annually were properly treated, it would effect a saving of at least one hundred million dollars each year.

Chemical treatment of timber in this country, on what might

* Abstract of a paper presented before the Baltimore & Ohio Operating Officers' Association, Deer Park, Md., June 26, 1915.

be considered an extensive scale, was first undertaken by the Atchison, Topeka & Santa Fe in 1885. Up to that time there were only 3 pressure plants in existence. At the close of 1890 there were 8 plants; in 1900, 15 plants; in 1905, 34 plants; in 1910, 74 plants and in 1914, 96 plants.

The first recorded use of treated crossties was in Maryland in 1838, and the first treating plant, which was in the form of open wooden tanks, was built in Lowell, Mass., in 1848. The preservative used at this and several of the other earlier plants was bichloride of mecury. The first permanent railroad plant using creosote was built by the Louisville & Nashville at West Pascagoula, Miss., in 1876.

The total number of ties treated in the year 1885 was about 120,000, which was approximately one-quarter of one per cent of the estimated number of ties used during that year by all the railroads in the United States. The number treated annually increased amazingly, and in the year 1913, 40,260,000 ties received preservative treatment, being about 28 per cent of the entire number purchased by the steam and electric railroads during that year.

The number of ties treated in 1914 exceeded the total of 1913 by over 3,000,000. The hewed ties treated comprised about 70 per cent of the total, or about 30,000,000, while approximately 14,000,000 were sawed. Ties of the red oak family lead in the number treated, followed by southern yellow pine, then in order of importance come Douglas fir, western pine, beech, gum, tamarack, maple, birch and elm.

When we consider wood preservation in its broadest aspect we include the prevention of loss by reason of using an expensive wood, or special costly sizes, where cheaper kinds would serve equally well.

W. H. Clifton, lumber agent, in a paper read at the railway storekeepers' convention, this year, brought this out very clearly. He said: "As in other lines of industry, there are certain practices which are followed in the use of lumber in railroad shop and building work today, which have been unchanged for many years, regardless of the decrease in the supply and increase in the cost of the lumber used, or in fact that other kinds of lumber, equally well adapted to the purpose, are more easily and cheaply obtained."

After citing various incidents showing the prevalence of such practices, he concludes:

"A remedy is not hard to find or difficult to administer. Usually a little educating of the consuming forces in the possibilities of substituting, with a view of economy, brings the desired result, for the average mechanic on a railroad is not averse to saving money for the company if some one will show him how to do it and co-operate with him in accomplishing the desired result."

Ties are purchased by the purchasing department. They are inspected by the timber preservation department and put in track by the maintenance of way department. Ties for treatment are shipped direct to the treating plant, and those to be used without treatment are distributed along the right-of-way and used in track as required. Ties received at the treating plants are cribbed in piles seven and one for seasoning. The seasoning period varies from 4 to 12 months, depending on the kind of wood.

White oak is rapidly increasing in price, and within a few years will doubtless be as little used for crossties as black walnut or other expensive woods. Chestnut and cedar are too soft for crossties, except under comparatively light traffic. The alternative is to utilize the inferior woods, such as the red oak family, beech, elm, etc. These woods decay rapidly when in contact with the ground. Preservative treatment makes them as good as or even better than the more costly woods.

One naturally wants to know what is really saved by going to all of this expense and trouble to treat crossties. A number of tables have been prepared and as many different estimates made to show the enormous saving in treating timber. There are so many factors to be taken into consideration that it is difficult to show what the average saving will be on a large railroad like the Baltimore & Ohio, which has upwards of 8,000 miles of track.

Mr. Emerson has kindly submitted the following, showing the total and annual cost of treated ties compared with untreated white oak ties:

	Treated, each	Untreated, each
Purchase price	$0.547	$0.717
Inspection	.015	.015
Treatment	.23	.....
Freight	.112	.067
Unload and pile	.02	.02
	$0.924	$0.819
(*a*)		
Truck to point of use	.01	.01
Install in track	.28	.28
Truck and burn old tie	.01	.01
Two tie plates	.24	.08 **
Four spikes	.05	.05
Interest on (*a*) (6 months on untreated, 12 months on treated.)	.056	.025
	$1.570	$1.274
(*b*)		
Supervision on (*b*) 5½ per cent	.086	.070
	$1.656	$1.344
Credit salvage, one-third value tie plates and spikes.	.097	.043
	$1,559	$1,301

** Cost of one-third of two tie plates, assuming that one-third of the untreated ties are tie plated.

Annual cost per year including 6 per cent interest with assumed life of 14 years, treated each $0.20; of eight years, untreated each $0.24.

Annual saving: On each treated tie over white oak untreated, $0.04.

Assume the production of treated ties to continue at its present rate, viz.:

1,000,000 per annum from Green Spring.
200,000 per annum from commercial plants.

Total...1,200,000 per annum.

Saving the first year 1,200,000 at $0.04	$48,000
Saving the second year 1,200,000 at $0.04 continues and there are also introduced another lot of 1,200,000, the total annual saving then being, at $0.04	96,000
Third year	144,000
Fourth year	192,000
Fifth year	240,000
Sixth year	288,000
Seventh year	336,000
Eighth year	384,000
Ninth year	432,000
Tenth year	480,000
Eleventh year	528,000
Twelfth year	576,000
Thirteenth year	624,000
Fourteenth year	672,000
From fourteenth year on, this annual saving is continuous at	$672,000

The Baltimore & Ohio uses more than 2,000,000 ties annually for renewals. It would not be proper to treat all of our ties because many are destroyed by mechanical abrasion, and for some years to come more or less white oak, cedar and chestnut ties will be purchased, which we use untreated. If we estimate that the number of treated ties that could be used to advantage on the Baltimore & Ohio is 1,700,000 a year, and if the saving on this number is placed at the lowest estimate, viz.: four cents per tie, the total net saving would be $68,000 for the first year, increasing a like amount each year until all ties put in track are treated ties.

As there are approximately 25,000,000 ties in track, and if we estimate 21,000,000 are treated, the net annual saving would be $840,000.

To centralize the tie business this department has been instructed not only to treat ties, but also inspect them before purchase, and when proper methods have been devised, it will also distribute the ties in accordance with orders from the maintenance of way department. As a further safeguard to insure the full life of ties after they are put in track this department will have inspectors travel over the road to note the condition of the ties taken out of track and determine whether or not they have been removed before their full life has been attained.

THE RAILWAYS OF CHILE.—More than half the railroads of Chile are owned and operated by the government, which has undertaken an ambitious scheme of extension. The feature of these additions is the "Longitudinal Railway." This line, from extreme north to extreme south, will be 2,132 miles long, of which 1,960 miles is already built.

General News Department

Of the 175,465 regular passenger trains run by the Southern Railway during the fiscal year ended June 30 last 155,536, or 89 per cent, made schedule time.

The members of the Russian Imperial Railways Commission, who have been in this country for some time on business for the government-owned railways of Russia, are this week making a tour over the main line of the Pennsylvania Railroad. The commission is composed of Count S. I. Schulenburg, president; Max N. Groten, Nicolas P. Kemmer, Alphons I. Lipetz and Arkadi S. Martynoff. The principal stop will be at Altoona.

The life insurance scheme, for the benefit of employees, announced recently by the Brooklyn Rapid Transit Company, Brooklyn, N. Y. (August 20, page 361), that over 5,200 employees have applied for insurance under the plan. A notice has been sent to all employees that the insurance will go into effect, as to all those who have applied for it, at noon, September 15. The applications, which had been received up to the 15th, and which constitute, therefore, the initial group, involve an aggregate premium of a little over $56,000 yearly. One-half of this is paid by the employees and one-half by the company.

Summary of Revenues and Expenses of Large Steam Roads

The following figures were compiled by the Interstate Commerce Commission from monthly reports of operating revenues and expenses of large steam roads for June, 1915. No reports are included for roads whose operating revenues for the year ended June 30, 1915, did not reach $1,000,000.

FOR THE MONTH OF JUNE.

Item	United States			Eastern District			Southern District			Western District		
	Amount	Per Mile of Road Operated		Amount	Per Mile of Road Operated		Amount	Per Mile of Road Operated		Amount	Per Mile of Road Operated	
	1915	1915	1914*	1915	1915	1914*	1915	1915	1914*	1915	1915	1914*
Average number of miles operated..	228,827.46	...	...	58,884.14	...	...	42,371,16	...	...	127,572.16	...	...
Revenues:												
Freight	$169,003,036	$739	$730	$79,860,381	$1,355	$1,266	$24,888,278	$587	$610	$64,254,377	$504	$520
Passenger	56,279,708	246	259	24,479,780	416	441	6,787,977	160	185	25,011,951	196	198
Mail	4,714,921	20	...	1,719,738	29	...	627,157	15	15	2,368,226	18	...
Express	6,380,693	28	82	2,845,613	48	146	874,935	21	23	2,660,145	21	62
All other transportation	7,584,629	33	...	4,177,285	71	...	655,071	15	16	2,752,273	21	..
Incidental	5,339,642	23	25	2,704,103	46	49	632,552	15	15	2,002,987	16	17
Joint Facility-Cr.	280,488	1	1	137,148	2	3	58,561	1	1	84,779	1	1
Joint Facility-Dr.	93,665	...	...	58,378	1	...	10,000	...	...	25,287	...	...
Railway operating revenues	$249,489,452	$1,090	$1,097	$115,865,470	$1,967	$1,905	$34,514,531	$814	$865	$99,109,451	$777	$798
Expenses:												
M'ntnance of way and structures	$34,310,293	$150	$169	$14,469,458	$246	$285	$5,239,615	$123	$120	$14,601,220	$114	$131
Maintenance of equipment	40,115,948	175	184	18,960,128	322	336	6,548,150	155	170	14,607,670	115	117
Traffic	5,155,806	23	23	1,932,147	33	34	885,059	21	23	2,338,600	18	19
Transportation	79,744,754	348	374	37,398,925	635	674	11,240,577	265	308	31,105,252	244	256
Miscellaneous operations	2,003,984	9	10	867,096	14	22	172,168	4	5	964,720	8	6
General	6,631,693	29	30	2,890,731	49	52	1,047,203	25	27	2,693,759	21	21
Transportation for Inv'stmnt-Cr.	814,922	4	1	58,284	1	...	121,273	3	2	635,365	5	1
Railway operating expenses	$167,147,556	$730	$789	$76,460,201	$1,298	$1,403	$25,011,499	$590	$651	$65,675,856	$515	$549
Net revenue from railway operations	$82,341,896	$360	$308	$39,405,269	$669	$502	$9,503,032	$224	$214	$33,433,595	$262	$249
Railway tax accruals	$11,345,126	$49	$52	$4,795,205	$82	$80	$1,519,551	$36	$39	$5,030,370	$39	$44
Uncollectible railway revenues	135,817	1	...	27,065	...	...	25,707	...	...	83,045	1	...
Railway operating income	$70,860,953	$310	$256	$34,582,999	$587	$422	$7,957,774	$188	$175	$28,320,180	$222	$205

*Because of changes in accounting classifications, consolidations of companies, etc., comparative averages are approximate only.

FOR THE TWELVE MONTHS ENDING WITH JUNE.

	1915	1915	1914*	1915	1915	1914*	1915	1915	1914*	1915	1915	1914*
Average number of miles operated..	228,554.14	...	...	58,874.35	...	...	42,320.00	...	...	127,359.70	...	...
Revenues:												
Freight	$1,988,594,599	$8,701	$9,200	$877,495,957	$14,905	$15,580	$305,614,735	$7,222	$7,973	$805,483,907	$6,324	$6,621
Passenger	630,177,652	2,757	3,038	276,394,861	4,695	5,029	85,771,256	2,027	2,369	268,011,535	2,104	2,330
Mail	57,021,857	249	...	20,745,455	352	...	7,524,223	178	177	28,752,179	226	...
Express	69,043,509	302	960	30,887,883	525	1,755	10,326,534	244	276	27,829,072	219	697
All other transportation	83,532,412	366	...	46,447,136	789	...	6,893,495	163	181	30,191,781	237	...
Incidental	58,416,906	256	274	30,116,433	511	535	7,322,472	173	191	20,978,001	165	179
Joint Facility-Cr.	3,458,071	15	16	1,579,727	26	26	695,403	16	17	1,182,941	9	11
Joint Facility-Dr.	1,215,531	5	5	765,613	13	9	158,569	4	3	291,349	2	2
Railway operating revenues	$2,889,029,475	$12,461	$13,483	$1,282,901,839	$21,790	$22,916	$423,989,569	$10,019	$11,181	$1,182,138,067	$9,282	$9,836
Expenses:												
M'ntnance of way and structures	$365,968,225	$1,601	$1,810	$154,213,392	$2,619	$3,023	$58,762,689	$1,389	$1,490	$152,992,144	$1,201	$1,349
Maintenance of equipment	498,871,462	2,183	2,360	235,876,536	4,007	4,370	80,789,856	1,909	2,122	182,205,070	1,431	1,497
Traffic	59,464,699	260	277	22,565,047	383	415	10,966,243	259	269	25,933,409	204	215
Transportation	1,017,797,060	4,453	4,902	473,874,689	8,049	8,904	146,602,307	3,464	3,907	397,320,064	3,120	3,361
Miscellaneous operations	22,902,287	100	128	10,605,096	180	252	2,190,847	52	59	10,106,344	79	93
General	74,646,461	327	337	31,883,072	542	552	11,950,944	282	299	30,812,445	242	251
Transportation for investment-Cr.	6,960,300	30	13	756,094	13	...	1,367,871	32	5	4,836,335	38	22
Railway operating expenses	$2,032,689,894	$8,894	$9,801	$928,261,738	$15,767	$17,516	$309,895,015	$7,323	$8,141	$794,533,141	$6,239	$6,744
Net revenue from railway operations	$856,339,581	$3,747	$3,682	$354,640,101	$6,023	$5,400	$114,094,554	$2,696	$3,040	$387,604,926	$3,043	$3,092
Railway tax accruals	$133,993,519	$586	$604	$55,422,186	$941	$959	$18,624,412	$440	$452	$59,946,921	$470	$489
Uncollectible railway revenues	640,345	3	...	193,151	3	...	114,958	3	...	332,236	3	...
Railway operating income	$721,705,717	$3,158	$3,078	$299,024,764	$5,079	$4,441	$95,355,184	$2,253	$2,588	$327,325,769	$2,570	$2,603

*Because of changes in accounting classifications, consolidations of companies. etc., comparative averages are approximate only.

Santa Fe Invites Suggestions from Stockholders

The Atchison, Topeka & Santa Fe, in sending out its September dividend checks and notices of the annual meeting to be held on October 28, in addition to asking for the usual proxy, has included the following paragraph:

"The fact that stockholders of the large corporations of the country seldom attend meetings or exercise their right to criti-

cize the management, or otherwise express opinion, is often commented on unfavorably and is sometimes claimed to be responsible for instances of mismanagement resulting in disaster. Your directors, in soliciting your proxy, do so because it is necessary that a quorum be present either by representation or in person. Any stockholder has the right, and is hereby requested, to make either at the meeting or in writing such suggestions or criticisms as may appear to him for the advantage of the company."

Texas Railways Urge Laws Against Trespassing

The Texas railways are conducting a campaign in the interest of adequate laws to prohibit trespassing. As a part of this campaign the Central Safety First Committee of the International & Great Northern has issued a bulletin calling attention to the large number of trespassers killed on the railways every year, and urging school teachers, employers of labor, ministers, parents and others to do everything in their power to educate those within their sphere of influence regarding the evils of trespassing. The circular states that during the last 13 years the International & Great Northern has carried on its trains nearly 20,000,000 passengers without killing or even maiming a single passenger in train accidents, "which proves that the International & Great Northern is a very safe road for passengers"; but that during the same period its trains killed or seriously injured over 500 people while trespassing on its yards and along the right of way, "which proves that the I. & G. N., like other railways, is a very unsafe place to walk upon."

Vice-President W. A. Webb, of the Missouri, Kansas & Texas, has issued a similar circular to all employees of the operating department, in which he says that more lives would be saved by the enforcement of laws against trespassing than by providing steel cars, installing block signals and abolishing grade crossings.

Pan-American Scientific Congress

The second Pan-American Scientific Congress is to be held at the office of the Pan-American Union, Washington, D. C., December 27, 1915, to January 8, 1916. The program is divided into nine main sections. The engineering section will be presided over by Gen. W. H. Bixby, formerly chief of the United States Army Engineers, as chairman, and the section on transportation, commerce, finance and taxation by L. S. Rowe, as chairman. The meetings of the engineering section will be devoted to such subjects as relate to water and land transportation and various problems of interest in the engineering sciences. The engineering committee has proposed for the series of special Pan-American conferences to be discussed by all of the participating countries the following topic: "Desirability and practicability of establishing a uniform railroad gage in Pan-America, and especially in Central and South America."

Railway Fire Protection Association

The second annual meeting of the Railway Fire Protection Association will be held October 5, 6 and 7, 1915, in the east room of Hotel La Salle, Chicago. The program of the convention follows:

TUESDAY, OCTOBER 5.

Morning Session, 10 A.M.

Roll call; Reading of minutes of last meeting; address of president; report of executive committee; address by T. C. Powell, vice-president, Alabama Great Southern.

Afternoon Session, 2 P.M.

Report on rules and regulations for the prevention of fire and protection of property. Robert Scott (A. C. L.) chairman.

WEDNESDAY, OCTOBER 6.

Morning Session, 10 A.M.

Report on fire prevention and protection in coaling stations. A. D. Brooks (I. C.) chairman.

Report on fire prevention and protection in grain elevators. Anson Murphy (A. G. S.) chairman.

Report on fire prevention and protection in terminal, classification and storage yards. G. A. Hays (U. S. Steel Corp.) chairman.

Afternoon Session, 2 P.M.

Report on cotton hazards. E. B. Berry (So. Ry.) chairman.

Report on oil burning appliances. J. S. Richards (Sunset Central) chairman.

Report on hand fire extinguishing apparatus. N. Searle (So. Pac.) chairman.

Visit to Illinois Central shops at Burnside.

THURSDAY, OCTOBER 7.

Morning Session, 10 A.M.

Report on statistics and forms. F. R. Auston (C. & E. I.) chairman.

Report on electric hazards. T. S. Potts (C., H. & D.) chairman.

Address by F. A. Silcox, district forester of the United States Forest Service, at Missoula, Mont., entitled, "The Railroads and Forest Fires."

Report on locomotive spark and ash pan hazard. H. W. Colson (A., B. & A.) chairman.

Afternoon Session, 2 P.M.

Report on fire prevention and protection of stations, freight depots and warehouses. W. S. Maryon (So. Ry.) chairman.

Unfinished business, new business; election of officers and executive committee.

Chief Interchange Car Inspectors' and Car Foremen's Convention

The seventeenth annual convention of the Chief Interchange Car Inspectors' and Car Foremen's Association was held at Murphy's Hotel, Richmond, Va., September 14 to 16, 1915, F. H. Hanson, assistant master car builder, New York Central, presiding. The meeting was opened with an invocation by the Rev. J. J. Scherer, and the association was welcomed on behalf of the state of Virginia by Attorney-General John G. Pollard, representing Governor Stuart, and on behalf of the city of Richmond by Mayor Geo. Ainslie. T. J. O'Donnell, arbitrator, Niagara Frontier Car Inspection Association, Buffalo, N. Y., responded for the association. President Hanson then delivered an address, calling attention to the greater uniformity of interpretation and improved enforcement of the rules of interchange resulting from the work of the association and laying stress on a number of conditions where further improvement is needed. H. Boutet, chief interchange car inspector, Cincinnati, Ohio, briefly sketched the development of the association and brought out the fact that a gain of 61 had been made in membership during the past year. After the reading of a number of communications the association took up the discussion of the revised rules of interchange.

The following supply companies had exhibits at the convention:

Boss Nut Company, Chicago and New York.—Boss nuts. Represented by J. W. Fogg.

Duff Manufacturing Company, Pittsburgh, Pa.—No. 119 Barrett jack; 50-ton high-speed ball-bearing jack with Cyclone lowering device; 25-ton journal jack. Represented by E. A. Johnson and C. A. Methfessel.

Grip Nut Company, Chicago.—Several types of Grip nuts; Riehle testing machine demonstrating their holding power and durability under repeated reapplications. Represented by H. E. Passmore.

Hale & Kilburn, Philadelphia, Pa.—Passenger car seats. Represented by R. H. Pilson.

McCord & Co., Chicago.—Pressed steel journal boxes. Represented by H. E. Creer.

Norton, A. O., Inc., Boston, Mass.—High-speed self-lowering jack. Represented by H. J. Wilson.

Standard Heat & Ventilating Company, Richmond, Va.—Unitherm steam heat equipment, Standard end train line valve and steam heat hose couplers; Standard ventilator. Represented by L. B. Rhodes.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—H. C. Boardman, D. L. & W., Hoboken, N. J. Next meeting, October 21-23, 1915, Boston, Mass.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 8 W. 40th St. New York. Annual convention, October 4-8, 1915, San Francisco, Cal.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOCIATION.—H. G. McConnaughy, 165 Broadway, New York. Meetings with American Electric Railway Association.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, November 17, 1915, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 19-21, 1915, Detroit, Mich.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.—George W. Lyndon, 1214 McCormick Bldg., Chicago. Annual meeting, 2d Tuesday in October, 1915, New York.

ASSOCIATION OF RAILWAY ELECTRIC ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Annual meeting, October, 1915.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meetings with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next meeting, October 19-21, 1915, St. Louis, Mo.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 14-16, 1915, Detroit, Mich.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILROAD MEN'S IMPROVEMENT SOCIETY.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May. Assembly Rooms of Trunk Line Association, 143 Liberty St., New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—J. Scribner, 1063 Monadnock Block, Chicago. Meetings with Association of Railway Electrical Engineers.

RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Fire Ins. Agt., Mobile & Ohio, Mobile, Ala. Next meeting, October 5-7, 1915, Chicago.

RAILWAY REAL ESTATE ASSOCIATION.—F. C. Irvine, 1125 Penn. St., Pittsburgh, Pa. Next meeting, October 13, 1915, Chicago.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—Carl Nyquist, C. R. I. & P., 1134 La Salle St. Sta., Chicago. Annual meeting, October 19-21, Colorado Springs, Colo.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Hotel Astor, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. R. R., East Buffalo, N. Y. Annual meeting, September 7-19, 1915, Chicago.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

The Chicago, Milwaukee & St. Paul, on September 15, added an observation car service to all of its through trains between Chicago and the Pacific coast.

Numerous facts which are of interest in connection with the movement to secure South American trade for industries in this country have been made the subject of a letter which the Pennsylvania Railroad has sent to the boards of trade of 70 cities and towns along its lines.

The Canadian Pacific has issued a new tariff covering shipments of fruits and vegetables from British Columbia to eastern points, making a number of important reductions in rates to enable the producers to reach eastern markets in an extensive territory. Many of through rates are provided to stations off the lines of the Canadian Pacific.

The Northern Pacific has notified the Public Service Commission of Washington of its decision not to make a reduction of rates asked by eastern Washington and Oregon farmers for the shipment of wheat eastbound for export. The officers of the road do not believe that any rate it could afford to make would divert the crop from the Puget sound ports.

The Pennsylvania Railroad has issued a new and enlarged edition of its directory of fruit, vegetable and produce growers. It will contain the names of more than 10,000 farmers, truckmen and orchardists in New York, New Jersey, Pennsylvania, Delaware, Maryland and Virginia. The directory will classify each grower according to the principal character of his produce, and there will be six classes, namely: Apples, white potatoes, sweet potatoes, cabbages, onions and general produce.

An involuntary petition in bankruptcy against the Chicago, St. Louis & Gulf Transportation Company, operating a steamboat line between LaSalle, Ill., and New Orleans, La., via the Illinois and Mississippi rivers, was filed in the United States district court at Chicago last week, and a receiver was appointed. This company began service a few months ago after making many announcements of its intention to operate a fast service at rates far below those of the railroads.

The western roads presented at Washington this week, Wednesday, their petition to reopen the freight rate case. They ask the commission to vacate its order permitting certain advances and to allow the carriers to submit arguments to show that the increases which have been allowed are not sufficient to afford reasonable compensation. Another petition was submitted by W. E. Lamb, attorney for the Illinois Coal Operators' Association and others, which recited that the order entered by the commission had resulted in making rates on coal from points in Illinois south of Chicago relatively higher than from lake points.

Traffic—Evening Classes in Traffic Work

The LaSalle Extension University of Chicago, which for several years has conducted correspondence courses in railway traffic work, announces the inauguration of a plan of resident class work in specialized courses relating to railway traffic matters, to begin on September 28. The instruction will take up, among other subjects, railway organization and management, government regulation, the legal aspect and liability of common carriers, classification and rate-making methods and principles, ocean traffic and trade, foreign commerce, railway accounting and industrial traffic organization. The class work will be conducted in the evenings at the Lake View building, 162 Michigan avenue, Chicago, where commodious class rooms have been established. In addition to the university officers and instructors the class room work will be presided over by practical traffic men in railway and industrial service. The traffic work of the LaSalle Extension University is in charge of John P. Curran, who has been connected with the Central Freight Association for six years, and a large number of prominent railway officers and industrial traffic men constitute the advisory board. Several railways have arranged to pay for courses for their employees.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The New Orleans Joint Traffic Bureau has filed a complaint with the Interstate Commerce Commission against the rates on beet and cane sugar from New Orleans to points in the southeast, which are alleged to be discriminatory in comparison with the rates on similar commodities from New York and Philadelphia to the same destinations in the southeast.

Complaints of merchants of Charleston, S. C., against the principal railroads for alleged discrimination in freight rates in favor of Wilmington, N. C., were the subject of hearings by George N. Brown, representing the Interstate Commerce Commission at Charleston, September 10 and 11. The hearing was adjourned to a date, to be named, in the latter part of October, at Washington.

Free Storage of Coal at Perth Amboy, N. J.

Plymouth Coal Company v. Lehigh Valley. Opinion by Commissioner Hall:

For more than 25 years prior to June 1, 1913, defendant's tariffs provided that cars containing anthracite coal forwarded to Perth Amboy for transshipment by boat and held at that port would not be subject to car-service charges. It was further provided that limited free storage at Perth Amboy was available to shippers and that space there would be allotted to them on the basis of the tonnage for the previous year of their respective shipments over the piers. Such free storage was limited in time to a period of two years. After the expiration of that time a charge of 15 cents per gross ton per month or fraction thereof was assessed.

Effective June 1, 1913, defendant filed tariffs canceling the provisions outlined above and providing, first, that the privilege of storing coal in bins at Perth Amboy had been withdrawn and that anthracite coal which was unloaded by defendant for the purpose of releasing needed car equipment would be subject to storage charge in the same amount as would have accrued under its car demurrage rules and regulations; and, second, that cars containing anthracite coal consigned to and held at Perth Amboy and various other points for transshipment by water would be subject to demurrage at the rate of $1 per car per day, computed on the average plan, allowing an average detention of five days per car free of charge.

The commission finds that the carrier has justified these charges, and also holds that the demurrage regulations on coal awaiting transshipment at this point are reasonable (36, I. C. C., 140).

Joint Rates with the East Jersey Railroad & Terminal Co.

East Jersey Railroad & Terminal Company v. Central of New Jersey, et al. Opinion by Commissioner Hall:

The East Jersey Railroad is a corporation operating a short narrow gage railway from a junction with the Central of New Jersey in Bayonne, N. J., south to a pier on the Kill von Kull, and in conjunction therewith, a fleet of tugs and barges in New York harbor. The Southern Cotton Oil Company, the complainant, and the Edible Products Company, each of which has a plant on the line of the terminal company, are principally interested. They contribute about one-third of the rail revenue of the terminal company, but do not control it.

For a number of years prior to April, 1914, the defendants participated with the terminal company in joint rates between various points and New York, including points in New York harbor within the established lighterage limits. Joint rates to New York, which are generally the same as to Bayonne, included literage to points in New York harbor within the lighterage limits or on board vessels for export. Under those tariffs certain transit services were available to industries at Bayonne, N. J., on the line of the terminal company. The commission finds that the carriers have not justified a cancellation of these joint rates made April, 1914, and a proposal to assess on traffic from points on the terminal company's rails that company's local rail rate of one cent a 100 lb., and its lighterage charge of three cents a 100 lb., in addition to the rate to Bayonne (36 I. C. C., 146).

STATE COMMISSIONS

The Public Service Commission of West Virginia has dismissed a petition asking for regulation of jitney carriages in Charleston, holding that the question is a local one which can be dealt with more appropriately by the city.

The Texas Railroad Commission, which has been holding hearings on the application of the railroads of the state for a general advance of 15 per cent. in freight rates, has disapproved the recommendation of attorneys for the commission calling for an indefinite postponement of the final hearing, pending the settlement of questions arising from the decision of the Interstate Commerce Commission in the Shreveport rate case. During the past week witnesses for the state commission have introduced evidence based on their examinations of the carriers' books, for the purpose of showing that lines in Texas have been "milked" by parent corporations outside the state.

PERSONNEL OF COMMISSIONS

Charles A. Russell, of Gloucester, has been appointed a member of the Massachusetts Public Service Commission, taking the place of Clinton White, who retired several months ago.

COURT NEWS

Excessive Damages

The New York Appellate Division holds that a verdict of $22,750 for the death of a foreman engaged in repairing electrical appliances on a railroad, who earned $105 a month, and paid to his wife $90 to $95 monthly, was excessive, and a reduction to $15,000 was within the trial court's discretion (Millette v. N. Y., W. & B., 154 N. Y. Supp., 792).

Liability for Taxes as Between Lessor and Lessee

In 1871 a New York railroad leased its property to another corporation, which agreed to pay to the lessor a small cash rental and 8 per cent dividends on the lessor's capital stock directly to the lessor's stockholders. The lease also required the lessee to pay all taxes levied on the property demised and on the business done by the railroad, but provided that it should not be required to pay the present income tax on the dividends, or any tax thereon imposed or thereafter to be imposed by whatever name it might be called. The Federal officers, in levying the income tax under the act of congress of October 3, 1913, treated the income from the dividends as part of the lessor's income and levied the tax accordingly, thereby exempting the stockholders from any liability for an income tax on such dividends. The lessor sued to compel the lessee to repay to it the amount of this tax. The New York Appellate Division holds that the present income tax clearly came within the spirit of the clause exempting the lessee from paying the "income tax," and could not be considered a tax on the property or business, and the lessor's complaint was accordingly dismissed (Rensselaer & Saratoga v. Delaware & Hudson, 154 N. Y. Supp., 739).

Excise Tax on Corporations—"Engaged in Business"

During the greater part of 1910 the Snake River Valley Company owned a line, which it leased to the Oregon Railroad & Navigation Co. for five years. The O., R. & N. operated the line, and was obligated by the lease to pay all expense of maintenance and renewal taxes on the property, and other incidental expenses, but was entitled to retain from the rental the cost of certain permanent improvements made. For the greater part of 1910, while the lease was in force, the lessor maintained its offices, transferred stock, collected and deposited the rental, and expended such sums as were necessary, in maintaining its corporate existence, including the state corporation tax. Before the end of the year the lease was canceled by mutual consent, and the lessor immediately sold and transferred all of the property, and from the proceeds paid its bonded and other indebtedness. The

Circuit Court of Appeals, Ninth Circuit, holds that the lessor was not "engaged in business" during the year, within the meaning of the corporation tax act, and that it was not subject to the excise tax imposed thereby (Miller v. Snake River Valley, C. C. A., 223 Fed., 946).

Limitation of Liability—Authority of Shipper's Agent

An interstate carrier's tariffs provided two rates on household goods, the lower being based on a declared value. Unknown to the railroad, a shipper's agent had no authority to declare value, but he signed a release, declaring the value of goods to be not above that on which the rate was based. Part of the shipment was never delivered. In an action for its loss the Federal court (Michigan) holds that the railroad was justified in relying on the authority of the agent tendering the shipment to sign such a contract, and the shipper was bound by it (American Brake S. & F. Co. v. Pere Marquette, 223 Fed., 1018).

Claims Under Workmen's Compensation Act

A lineman in the employ of an interstate railroad was engaged in erecting a new telegraph line when a violent rainstorm arose. The railroad provided no shelter for such an emergency, though it made no deduction of wages for interference with the work. The lineman, with others, took shelter under some cars on a side track. An engine of another railroad moved these cars and the lineman was badly injured. In proceedings under the New York Workmen's Compensation Act, the New York Appellate Division holds that the injury was "accidental" within the meaning of the act and arose "out of and in the course of his employment," so that an award of compensation was properly made (Moore v. Lehigh Valley, 154 N. Y. Supp., 620).

The Illinois Central has filed in the United States District Court at Danville, Ill., a petition for an order restraining the Interstate Commerce Commission from continuing an investigation growing out of complaints of Illinois coal operators, asking the commission to assess damages against the railroad for failure to furnish cars. The railroad asks that the commission's investigation be stopped and the case be tried in the courts at once.

Injuries to Trespassers and Employees

The Circuit Court of Appeals, Ninth Circuit, holds that a railroad employee who was killed while constructing a temporary bridge over which the railroad intended to move interstate trains, was employed in interstate commerce, within the Federal Employees' Liability Act, since that work was not independent of the interstate commerce in which the railroad was engaged (Columbia & P. S. v. Sauter, C. C. A., 223 Fed., 604).

The Texas Supreme Court holds that a railroad yard clerk required to check up cars in trains and take their numbers to make a proper report thereof, is not, while walking through the yard, engaged in interstate commerce within the Federal Employees' Liability Act, in the absence of anything to show his connection with an interstate freight train in the yard or anything to show his purpose in walking through the yard, or the character of the work done by him (Pecos & N. T. v. Rosenbloom, Tex., 177 S. W., 952).

A Quebec, M. & S. car left a point in Pennsylvania for a point in Maine, and then came empty to a point in New York, where it was taken to the Delaware & Hudson's car shop. While it was being repaired the head of a nail flew up and struck an employee's eye. When it left the shop the car was taken empty to a point in New York state and loaded for an interstate trip. The New York Appellate division holds that the actual work on the car at the time of the injury determined whether it was interstate or intrastate work, and that the employee had no remedy under the Federal Employees' Liability Act, but only under the State Workmen's Compensation Act (Parsons v. Delaware & Hudson, 153 N. Y. Supp., 179).

In an action for personal injuries it appeared that the plaintiff, a minor, was injured by the fall of a bank of earth forming a cave, near the defendant's right of way in a cut formed by the right of way. The plaintiff had taken refuge in the cave to escape a shower, and after the shower remained there with some companions at play. The wires of the railroad fence in the vicinity were down, and the railroad was chargeable with notice of trespass of boys on the track, and might, by reasonable diligence, have acquired knowledge of the cave, which was attractive to children. It was held by the Oregon Supreme Court that negligence being the infraction of a legal obligation due from one person to another, and the defendant, owing no duty to the plaintiff, who was a trespasser, except not to negligently or recklessly injure him, it was not liable (Haynes v. Oregon-Washington R. & U., Ore., 150 Pac., 286).

A section foreman of a railroad engaged in interstate commerce, went out with a crew to repair a broken joint in the track. While returning he assisted his crew to lift their hand-car from the track to clear it for a freight train made up of cars destined both to intrastate and interstate points. One of the crew gave out and this threw an extra weight on the foreman, whose back was injured. The Texas Court of Civil Appeals held that he was "engaged in interstate commerce" within the Federal Employees' Liability Act. It also held that he assumed the risk incidental to helping his crew to lift their car from the track, and could not recover, since the Federal Act leaves the defense of assumed risk open to the employer (except where the employer's violation of any statute enacted for the safety of the employees contributed to the injury) notwithstanding that the defense of assumed risk does not obtain under the state statutes (Texas & P. v. White, Tex., 177 S. W., 1185).

Crossing Accident—Insufficient Proof of Negligence

In an action against a railroad for injury to an automobile at a crossing, it appeared that the plaintiff, on a dark night, was driving a touring car toward the defendant's crossing at a speed of from 12 to 13 miles an hour. He was familiar with the road and knew that the tracks were there. His automobile had lighted headlights of ordinary brilliancy. When about 20 feet away he saw something on the crossing. He could have stopped in from 12 to 15 feet. He did not stop or slacken speed, but attempted to go around the obstruction. When he had gone five or six feet further he put on his brakes, but nevertheless hit a freight car which was momentarily standing on the crossing, and the automobile was damaged. The New Jersey Supreme Court held that the railroad had the right, in the reasonable and safe operation of the railroad, to stop its car for a reasonable length of time on the crossing. There was no evidence of unreasonable operation of the train. There was, therefore, no proof of negligence of the railroad forming the proximate cause of the injury and motions for nonsuit and for a direction of a verdict for the defendant should have been sustained (Jacobson v. N. Y., S. & W. (N. J.), 94 Atl., 577).

Measure of Damages to Valuable Goods

A bill of lading for a shipment of raw silk provided that "the amount of any loss or damage for which any carrier is liable shall be computed on the basis of the value of the property, * * * unless a lower value has been represented in writing by the shipper or has been agreed upon, * * * in any of which events such lower value shall be the maximum amount to govern such computation." The following clause was stamped on the bill: "Liability limited to one dollar per pound. The consignor of this property has the option of shipping same at a higher rate without limitation as to value in case of loss or damage from causes which would make the carrier liable, but agrees to the specified valuation named in case of loss or damage * * * because of the lower rate thereby accorded for transportation." The silk was damaged by being knocked from the car in a collision for which the railroad was liable. Claim was made based on the theory that the rule to be applied in calculating loss was the same as would be applied when computing a particular average loss under a policy of marine insurance. The Circuit Court of Appeals, Second Circuit, held that the case was not one of insurance; but the question was, what was the meaning of the two clauses? They were consistent and should be construed together. The court, therefore, held that the specified sum of one dollar a pound was not a limitation of the carrier's liability, but an agreed conventional valuation, which, under these provisions, was to be taken as the real value of the goods for the purpose of computing the amount of the carrier's liability; and that the measure of such liability was only the difference between the damaged value of the goods and their value at one dollar a pound. Duplan Silk Co. v. Lehigh Valley, C. C. A., 223 Fed., 600.

Railway Officers

Executive, Financial, Legal and Accounting

B. A. Worthington, receiver of the Cincinnati, Indianapolis & Western, has been appointed vice-president and general manager. See item in Financial News.

E. N. Heigho, president, general manager and traffic manager of the Pacific & Idaho Northern, has been appointed receiver, and will also act as general manager, traffic manager, treasurer and purchasing agent. W. P. Briggs continues as general attorney. T. Cox, formerly acting auditor, is now auditor. F. D. Stover, formerly assistant secretary and assistant treasurer, is now assistant treasurer. E. D. Perkins continues as assistant traffic manager. A. H. O'Leary continues as superintendent, and L. L. Collier, acting master mechanic, is now master mechanic. All with headquarters at New Meadows, Idaho.

Operating

Ben B. Johnson has been appointed chief despatcher and division operator of the Pasco division of the Northern Pacific, with headquarters at Pasco, Wash., vice E. J. Moran, promoted.

J. P. Walker, assistant engineer of the valuation department of the Atlantic Coast Line, at Petersburg, Va., has been appointed assistant superintendent of the Charleston district, with office at Charleston, S. C.

J. Kirk, superintendent of the Gary division of the Elgin, Joliet & Eastern, has been granted leave of absence on account of ill health. C. H. Doorley, superintendent of terminals at Joliet, Ill., has been appointed acting superintendent of the Gary division. The office of superintendent of Joliet terminals has been abolished. Effective September 15.

Kepler Johnson, trainmaster on the Southern division of the Chicago, Rock Island & Gulf, at Ft. Worth, Texas, has been appointed trainmaster on the Arkansas division of the Chicago, Rock Island & Pacific, with headquarters at Little Rock, Ark., vice W. A. Hyde, who has been transferred as trainmaster to the Southern division of the Chicago, Rock Island & Gulf, with headquarters at Ft. Worth, Tex.

John J. Pelley, superintendent of the Tennessee division of the Illinois Central, has been appointed superintendent of the Memphis division of the Yazoo & Mississippi Valley, with headquarters at Memphis, vice Bess A. Porter, transferred. John M. Egan has been appointed to succeed Mr. Pelley as superintendent of the Tennessee division of the I. C., with headquarters at Fulton, Ky. Effective September 15.

E. Wilson, superintendent of the Ft. Worth division of the International & Great Northern, has been appointed trainmaster on the San Antonio division with headquarters at San Antonio, Tex., vice J. L. Otis, resigned. J. C. Resch, assistant superintendent of the Gulf division, with headquarters at Palestine, Tex., has been appointed superintendent of the Fort Worth division, with headquarters at Mart, Tex., vice E. Wilson, transferred. G. P. Wolf has been appointed assistant superintendent of the Gulf division, with headquarters at Palestine, vice J. C. Resch, promoted. Effective September 1.

Traffic

J. L. Harris has been appointed general live stock agent of the Chicago & Alton with headquarters at Chicago, Ill.

P. A. Powers has been appointed general agent of the Chicago & Eastern Illinois, with headquarters at Lennox, Ill.

F. M. Miller, commercial agent of the Toledo, St. Louis & Western, at Los Angeles, Cal., has been appointed general agent with headquarters at the same place. Effective September 1.

George H. Kummer, whose appointment as assistant general freight agent of the Chicago & Eastern Illinois, has been announced, was born in Keokuk, Iowa, on March 6, 1870. He was educated in the common and high schools and in 1886 entered railway service as an office boy in the office of the superintendent and division freight agent of the Chicago, Rock Island & Pacific at Keokuk. In 1887 he was appointed clerk in the same office, and in 1890 was promoted to chief clerk of the joint local office of the Rock Island and the Pittsburgh, Cincinnati, Chicago & St. Louis at Washington Heights, Ill. In 1891 he went to Topeka, Kan., to become a clerk in the auditor's office of the Atchison, Topeka & Santa Fe. In 1892 he was clerk in the freight auditor's office of the Rock Island in Chicago. In 1893 he was appointed traffic clerk in the general freight office of the same road; in 1894 soliciting freight agent, headquarters in Chicago; in 1896 clerk in the Chicago office of the P., C., C. & St. L.; in 1898 assistant to the traffic manager of the Glucose Sugar Refining Company, Chicago; in 1899 contracting freight agent of the Frisco Lines in Chicago; in 1902 traveling freight agent, Frisco Lines, Chicago; in 1904 division freight agent of the Chicago & Eastern Illinois, at Salem, Ill.; 1911, general agent, Frisco Lines, Chicago; from December 9, 1912, to September 1, 1915, coal freight agent of the C. & E. I., with headquarters in Chicago; September 1, 1915, assistant general freight agent of C. & E. I., Chicago.

J. A. Simmons, division freight agent of the Cincinnati Hamilton & Dayton, at Indianapolis, Ind., has been appointed general freight and passenger agent of the Cincinnati, Indianapolis & Western.

Theron O. Jennings, whose appointment as freight traffic manager of the Chicago & Eastern Illinois was announced in our issue of two weeks ago, was born in Waukee, Iowa, on October 9, 1873. He received a high school education and entered railway service in 1892 as a clerk in the local freight office of the Des Moines Union Railway, at Des Moines, Iowa. In 1895 he was appointed freight solicitor of the Chicago, Rock Island & Pacific, with headquarters at Des Moines. Since that time he has been appointed to the following positions: Freight solicitor of the Rock Island at Kansas City, Mo., 1898; traveling freight agent of the Rock Island, with headquarters at Kansas City, Mo., 1900; division freight agent of the Rock Island at Chicago, Ill., 1902; general agent of the same road at Milwaukee, Wis., 1903; freight claim agent of the Chicago & Eastern Illinois, with headquarters at Chicago, 1907; general agent of the same road at Chicago, 1908; assistant general freight agent at Chicago, 1910; general freight agent, Chicago, 1912; and freight traffic manager, with headquarters at Chicago, September 1, 1915.

T. O. Jennings

Engineering and Rolling Stock

F. K. Bennett, supervisor of the Minneapolis & St. Louis, at Monmouth, Ill., has been appointed valuation engineer, with office at Minneapolis, Minn.

James P. Nelson, member of the valuation committee of the Chesapeake & Ohio, and the Chesapeake & Ohio of Indiana, has been placed in charge of the engineering work of the committee.

E. J. Harris, master mechanic of the Chicago, Rock Island & Pacific at Trenton, Mo., has been appointed acting mechanical superintendent of the Second district with headquarters at Topeka, Kan., succeeding G. W. Lillie, resigned, and P. Linthicum, assistant superintendent of shops at Silvis, Ill., has been appointed acting master mechanic of the Missouri division with headquarters at Trenton, Mo., vice Mr. Harris. Effective September 15.

W. O. Thompson, district master car builder of the New York Central at East Buffalo, N. Y., has been appointed to the office

of superintendent rolling stock for the lines west of Buffalo with headquarters at Cleveland, Ohio. The car department thus becomes entirely separated from the motive power department, this condition now existing on all the New York Central Lines, with the exception of the Boston & Albany and the Pittsburgh & Lake Erie. R. L. Chandler, general piece work inspector, has been appointed district master car builder of operating district No. 2, to succeed W. O. Thompson, promoted.

T. A. Albright, foreman engineer of the Texas & Pacific, has been appointed road master mechanic, with headquarters at Marshall, Texas. J. J. Carey, master mechanic at Marshall, has been appointed superintendent of shops in that city. F. W. Boardman has been appointed assistant to the mechanical superintendent, with headquarters at Marshall. W. M. Schmalzreid has been appointed general inspector of passenger and freight cars for the system, with headquarters also at Marshall, Texas. J. S. Schneider, machine shop foreman, has been promoted to general foreman in charge of the erecting and machine shop at Marshall.

OBITUARY

J. B. Rishel, division freight agent of the Chicago, Rock Island & Pacific at Hutchinson, Kan., died in that city on September 10.

William L. White, general agent of the Pere Marquette, at Milwaukee, Wis., died on September 6, after 18 years of service with the road.

James E. Stagg, vice-president of the Durham & Southern, with headquarters at Durham, N. C., died in that city on September 10.

Colin Studds, assistant general passenger agent of the Pennsylvania Railroad, with office at Philadelphia, Pa., died on September 11, at his home in Wayne, at the age of 54.

Winfield S. Tinsman, chairman of the General Managers' Association of Chicago, and chairman of the Association of Western Railways, died at Rochester, Minn., on Wednesday of this week after an operation on his throat. Mr. Tinsman had been in bad health for over two years. He was born September 8, 1867, at Berryville, N. Y. He graduated from the public schools in May, 1882, and began railway work in the same year with the Chicago, Rock Island & Pacific. He was consecutively messenger for three years; telegraph operator from 1885 to 1887; train despatcher from March, 1888, to August, 1890; chief train despatcher for the next seven years, all at Trenton, Mo., and trainmaster at Horton, Kan., from October, 1897, to May, 1901. He was then made superintendent of Chicago terminals, and from May, 1902, to June, 1905, was superintendent, first of the Oklahoma and later of the Missouri divisions, and from 1905 to 1906 was general superintendent of the Choctaw district. He was then appointed general superintendent of the Southwestern district, then was assistant general manager for a year from April, 1907, and was then manager of the Southern and Choctaw districts until December, 1909. In the latter month he was made general manager of the entire system. From February, 1911, to February, 1912, he was general manager of the First district, and then to October, 1912, was assistant to the president, all with the Rock Island. Mr. Tinsman then was appointed chairman of the General Managers' Association of Chicago, and later chairman of the Association of Western Railways.

Winfield S. Tinsman

Equipment and Supplies

LOCOMOTIVE BUILDING

THE ANN ARBOR has ordered 3 Mikado type locomotives, with 27 by 30-in. cylinders, from the Lima Locomotive Corporation.

THE TEXAS & PACIFIC, reported in the *Railway Age Gazette* of last week as having ordered a number of locomotives from the Baldwin Locomotive Works, has ordered 13 locomotives from that company.

THE ERIE, which was reported in the *Railway Age Gazette* of September 3 as having ordered 5 Santa Fe type locomotives from the American Locomotive Company, has placed additional orders for 28 locomotives of the same type. The total order for 33 locomotives has been divided as follows: American Locomotive Company, 18; Baldwin Locomotive Works, 10, and Lima Locomotive Corporation, 5.

THE CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA was reported in the *Railway Age Gazette* of last week as having ordered 4 Pacific type and 6 Mikado type locomotives from the American Locomotive Company. The Pacific type locomotives will have 25 by 28-in. cylinders, 75-in. driving wheels and a total weight in working order of 260,000 lb. The Mikado type locomotives will have 27 by 32-in. cylinders, 61-in. driving wheels and a total weight in working order of 302,000 lb.

THE CHICAGO & NORTH WESTERN was reported in an unconfirmed item in the *Railway Age Gazette* of September 10 as having ordered 12 Pacific type, 12 Mikado type, 10 switching and one narrow-gage locomotives from the American Locomotive Company. This order has now been confirmed. Six of the Pacific type locomotives will have 25 by 28-in. cylinders, 75-in. driving wheels and a total weight in working order of 260,000 lb. and 6 will have 22 by 26-in. cylinders, 69-in. driving wheels and a total weight in working order of 302,000 lb. The 12 Mikado type locomotives will have 27 by 32-in. cylinders, 61-in. driving wheels and a total weight in working order of 165,000 lb. The 10 six-wheel switching locomotives will have 21 by 28-in. cylinders, 51-in. driving wheels and a total weight in working order of 165,000 lb. The narrow-gage Mogul type locomotive will have 12 by 18-in. cylinders, 43-in. driving wheels and a total weight in working order of 55,000 lb.

CAR BUILDING

THE MINNEAPOLIS & ST. LOUIS is in the market for 100 box cars.

THE CHICAGO & NORTH WESTERN is in the market for 500 ore cars.

THE ERIE has ordered 300 all-steel drop-end gondola cars from the Standard Steel Car Company.

THE BUTTE, ANACONDA & PACIFIC has ordered 100 50-ton ore cars from the Western Steel Car & Foundry Company.

THE ILLINOIS CENTRAL is in the market for 1,000 refrigerator cars. It is also inquiring for 500 fruit cars and 500 box cars for the Central of Georgia.

THE WHEELING & LAKE ERIE, W. M. Duncan, receiver, has been granted permission by the federal court to issue certificates for the purchase of new cars. The petition asked for the issuance of $2,000,000 in certificates, but only one-half of this amount was granted.

IRON AND STEEL

THE HAVANA CENTRAL has ordered 1,500 tons of rails from the Bethlehem Steel Company.

THE LOUISVILLE & NASHVILLE has ordered 43,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

THE ATLANTIC COAST LINE has ordered 20,000 tons of rails from the Tennessee Coal, Iron & Railroad Company.

THE ATCHISON, TOPEKA & SANTA FE has ordered 35,000 tons of 90-lb. rails from the Colorado Fuel & Iron Company.

Supply Trade News

W. H. P. Fisher has been appointed sales manager of the L. M. Booth Company of New York, manufacturers of the Booth water softeners. Mr. Fisher has been selling water softening plants to railroads for 12 years. He will make his headquarters at the engineering department of the company in Jersey City, N. J.

The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, has been awarded two prizes by the International Jury of Awards at the Panama-Pacific International Exhibition. They are the grand prize from the department of agriculture for press machines and a gold medal from the department of machinery for forcing presses and equipment.

Walter H. Evans, of Chicago, has been appointed western railroad department manager of the U. S. Metal & Manufacturing Company, New York. Mr. Evans was recently manager of the motor gear department of the Edgar Allen American Manganese Steel Company, Chicago, and previous to his connection with this company was connected with several electric and steam roads in the capacity of master mechanic and superintendent of motive power. Mr. Evans will make his headquarters in the McCormick Building, Chicago.

The Roberts & Schaefer Company, Chicago, engineers and contractors, has been awarded a contract by the Louisville & Nashville for a large automatic electric coal-handling equipment for Pensacola, Fla., using duplicate hoist, having an elevating capacity of 400 tons an hour. The same company has also been awarded a contract by the Canadian Northern Pacific for a large standard counterbalanced bucket locomotive coaling plant with automatic elevating equipment for immediate installation at Kamloops Junction, B. C. The contract price was $12,000.

In reply to a request on the part of the Iron Age for a statement as to the operations at Eddystone, Pa., in which the Baldwin Locomotive Works is interested, S. M. Vauclain, vice-president of the company, has briefly recounted the various activities as follows: The Baldwin Locomotive Works is engaged in filling large export orders for locomotives and their parts, including wheels, tires, axles and various forgings. The company now has 11,500 men on its payroll. The Remington Arms Company of Delaware has leased a number of buildings which the Baldwin Locomotive Works has erected, suitable for the manufacture by the Remington Company of a large number of military rifles which are to be exported. This plant when running full will probably employ 15,000 men. The Eddystone Munitions Company has leased from the Baldwin Locomotive Works buildings which the latter has erected on its property at Eddystone. The manufacture of munitions by the company will probably employ 10,000 men. The Baldwin Works contemplates building on the river front at Eddystone a pier or bulkhead so that shipments of all classes of products made by the companies mentioned may be made direct, without transshipment at New York or any other port.

Among the 23 members of the Naval Advisory Board of Inventions selected by Josephus Daniels, Secretary of the Navy, on the advice of eleven of the engineering and scientific societies, there are a number of appointments of special interest to the railway supply field. The appointments included among others: W. R. Whitney, Schenectady, N. Y., director of the research laboratory of the General Electric Company, selected by the American Chemical Society; Frank Julian Sprague, New York, consulting engineer for the Sprague Electric Works, the Otis Elevator Company, and the General Electric Company, and founder of the Sprague Electric Railway Motor Company, selected by the American Institute of Electrical Engineers; Benjamin G. Lamme, Pittsburgh, Pa., chief engineer of the Westinghouse Electric & Manufacturing Company, a leader in the development of alternating current apparatus and a pioneer in the development of direct current apparatus for railway lighting and power work, selected also by the Institute of Electrical Engineers; Peter Cooper Hewitt, New York, inventor of the electric lamp, selected by the Inventors' Guild; William Laurence Saunders, New York, chairman of the board, Ingersoll-Rand Company, New York, selected by the American Institute of Mining Engineers, and William Leroy Emmet, Schenectady, N. Y., engineer, General Electric Company, who designed and directed the development of the Curtis turbine, selected by the American Society of Mechanical Engineers. Arthur Craven, chief engineer of the New York Public Service Commission, First District, is also one of the members, having been selected on the advice of the American Society of Civil Engineers.

American Locomotive Company

The recently issued annual report of the American Locomotive Company for the fiscal year ended June 30, 1915, shows that in that period the company experienced the worst depression of business of the 14 years of its existence. The gross earnings totaled but $9,303,298, or $20,684,140 less than the $29,987,438 of 1914. The 1915 gross earnings, in addition, were about 17 per cent of the gross earnings of $54,868,175 for 1913, and were less than one-half of the gross earnings of $19,008,634 for 1909, which was the worst previous year.

The gross earnings for the year just closed lacked $451,297 of meeting the manufacturing, administrative, and other expenditures incurred in operations, and as there was charged off for depreciation $1,040,684, the total loss for the year was $1,491,980 as compared with a profit of $2,076,127 in the previous year. The 7 per cent preferred dividend of $1,750,000 was paid from surplus and the total reduction in that account was $3,241,980, leaving a balance on June 30, 1915, of $8,293,678.

The report says that the productive operations of the company as a whole averaged about 17 per cent of capacity and at times ran as low as 8 per cent. The Schenectady and Cooke plants were the only ones of the company's eight plants which were not closed entirely or for a large part of the year. The company should expect a better year in 1916. It has secured large foreign orders for both shells and locomotives and on June 30, 1915, it had $5,838,235 of locomotive orders on its books as compared with $4,162,356 on June 30, 1914.

The combined balance sheet for the American Locomotive Company and the Montreal Locomotive Works, Ltd., on June 30, was as follows:

ASSETS.		
Cost of property		$52,209,638
Securities owned		748,499
Convertible assets—		
Cash assets	$15,409,479	
Accounts collectible	6,160,137	
Bills receivable	1,646,567	
Accrued interest	40,145	
Material and supplies	2,440,714	
Contract work in course of construction	1,738,651	
Locomotives, snow plows, etc., in stock	269,232	
		27,704,926
Sundry deferred charges		61,135
Notes discounted (per contra)		148,031
		$80,872,228
LIABILITIES.		
Capital stock—		
Preferred	$25,000,000	
Common	25,000,000	
		$50,000,000
Bonded debt of constituent companies		1,932,000
Current Liabilities—		
Gold notes outstanding	3,666,000	
Accounts payable	14,156,918	
Income tax withheld at source	818	
Accrued interest	26,480	
Unclaimed interest	997	
Dividend on preferred stock payable July 21, 1915	437,500	
		$18,288,713
Endorsements (per contra)		148,031
Depreciation reserve		1,005,307
Reserve for loss in liquidation of automobile business		964,858
Reserve for additions and betterments		239,641
Profit and loss surplus, June 30, 1915		8,293,678
		$80,872,228

TRADE PUBLICATIONS

ARMCO IRON.—The American Rolling Mill Company, Middletown, Ohio, has issued a booklet describing the products made from Armco iron. This gives in some detail the various forms in which this material is produced and the manner of application in various forms of construction.

VERTICAL OIL ENGINES.—This is the title of Bulletin No. 501, recently issued by the National Transit Company, Department of Machinery, Oil City, Pa. The booklet deals particularly with the type VT-13, two-cycle, single-cylinder, vertical oil engines, made by this company, and it contains detailed descriptions of the machine itself and its parts.

Railway Construction

ATCHISON, TOPEKA & SANTA FE.—This company will build a branch, it is said, from Seligman, Ariz., south into the Bagdad country and the Hillside mining district. The Bagdad Copper Company has been carrying on extensive development work in the Hillside district and the new branch is to be built to provide an outlet for ore from the company's mines.

BALTIMORE & OHIO.—An officer writes regarding the report that the Baltimore & Ohio will build a line from its Hagerstown branch, Maryland, to the plant of the Security Cement Company, about four miles, that the plans have not yet been completed, but the company expects to decide upon this work soon.

CANADIAN NORTHERN.—This company is building two miles of additional tracks in the yards at Port Arthur, Ont., and at Fort William, and is also putting in new sidings and extending the yards at various points on the line between Port Arthur and Winnipeg, Man. The line from Winnipeg, Man., to Grand Marais is being extended to Victoria Beach, 15 miles, and it is expected that the grading, bridging and track laying will be completed this year. The Thunderhill branch, which extends from Thunderhill Junction, Man., west to Preeceville, Sask., 72 miles, is being extended beyond that place. Grading work on a 21-mile line from Canora north to connect with the Thunderhill branch at Sturgis, two miles east of Preeceville, was completed in 1914, and it is expected that the track laying and ballasting will be finished this year. Grading was also finished during 1914 on a branch from Wroxton, Sask., west via the Neepawa-Russell-Ross Junction line into Yorkton, Sask., 26 miles, and the track laying and ballasting will be completed this year. An extension of the line now in operation from Delisle, Sask., south to Tichfield, and from Tichfield west to Elrose, is projected southeast from Tichfield to Findlater on the Regina branch. An extension is also projected from Elrose west towards Edmonton, about 250 miles, on which grading has been finished to Eston, 35 miles, and track laying and ballasting on this section will be completed this year. The Cowan Construction Company is grading an additional section of 30 miles. The company also expects to complete this year the ballasting work and track laying on the extension from Bienfait, Sask., west to Estevan, 9 miles. Grading work is now under way by the Northern Construction Company on a line from Calgary, Alta., south to MacLeod, 103 miles, and is expected to be finished this year. A section of about 17 miles has already been graded.

CANADIAN PACIFIC.—On the Weyburn-Lethbridge branch from Weyburn, Sask., to Lethbridge, Alta., the line is now in operation at the west end from Lethbridge to Stirling, 18.9 miles, and from Stirling east to Foremost, 49.2 miles, a total of 68.1 miles. Grading was finished last year easterly from Foremost to Pakowki, 25 miles, and track laying on this section will be carried out at once. It is expected that this work will be finished by October 1.

CLEVELAND & OHIO CENTRAL ELECTRIC.—This road has let the contract for its first 55 miles of track from Cleveland, Ohio, to Wooster, to the Lathrop-Shea & Henwood Company, Buffalo, N. Y.

DOVER, MILLERSBURG & WESTERN (Electric)—Plans are being made to start work, it is said, on a line from Canal Dover, Ohio, west via Sugar Creek to Millersburg, about 25 miles. F. F. Phillips, Canal Dover, is said to be interested.

ELECTRIC SHORT LINE.—This company has awarded the contract for building the extension from Winsted, Minn., west to Hutchinson, 45 miles, to H. F. Balch & Co., Minneapolis (September 10, p. 487).

GREAT FALLS & SOUTHWESTERN.—Incorporated to construct a railroad 60 miles long from Ulm, Mont., 11 miles east of Great Falls, on the Great Northern, to Hound creek.

HOUSTON & RICHMOND INTERURBAN.—See Houston, Richmond & San Antonio Interurban.

HOUSTON, RICHMOND & SAN ANTONIO INTERURBAN.—The charter of the Houston & Richmond Interurban is to be amended, it is said, to change the name of the Houston, Richmond & San Antonio, and to increase its capital to $250,000. A preliminary survey has been made over two routes for a line from Houston west to San Antonio, about 215 miles. One of the surveys is via Richmond, Rosenberg, Gonzales and Seguin to San Antonio, and the other survey is via. Richmond, Wharton and Yoakum. E. Kennedy, of Houston, and residents of that city are back of the project.

MONONGAHELA VALLEY TRACTION.—A preliminary survey has been made for a line, it is said from Weston, W. Va., southwest to Glenville, about 25 miles, but the company has not yet decided to carry out the work. Between Clarksburg and Salem, W. Va., surveys have been completed and location made for a 6-mile extension of the line now in operation on about 6 miles from Clarksburg west via O'Neil.

NORTH CAROLINA ROADS.—Work on a lumber road has been finished by the Kinston Manufacturing Company, it is said, from a connection with the Kinston Carolina Railroad, at Pink Hill, N. C., south to Beulaville, 10 miles. An extension of the line may be built south to Chinquapin, 8 miles, or to Maple Hill, about 20 miles. J. T. Deal or J. H. Canady, president, Chamber of Commerce, Kinston, may be addressed.

NORFOLK & WESTERN.—The report of this company for the year ended June 30, 1915, shows that on the Virginia-Carolina Railway, the North Carolina division was completed and was put in operation in May to Elkland on the Ashe-Wautauga county Line, N. C., 48.64 miles. The New River, Holston & Western built an extension from Rocky Gap, Va., to Suitars in Bland county, Va., 13.87 miles, which was completed and put in operation in September, 1914. The Tug River & Kentucky bridge over Tug river in Kentucky, was built and track was laid on 0.89 miles to Blackberry creek, and grading work on the line up Blackberry creek to the mouth of Peters Fork, 1.38 miles, has been completed. The Williamson & Pond Creek is building at Leckie, W. Va., a spur 1.03 miles long, with a Y connection 0.15 miles to reach operations of the Leckie Collieries Company, and the Burkeville to Pamplin low grade connecting line is under construction from Pamplin, Va., to Burkeville, 36.93 miles. The Jacobs Fork branch is under construction from its junction with the Dry Fork branch at Rift, W. Va., to the operation of the New River & Pocahontas Consolidated Coal Company, 3.93 miles, and the grading work is about 75 per cent completed. The Cucumber branch of Jacobs Fork branch, 1.28 miles long, to other operations of the same company, is also under construction, and the grading work is 90 per cent completed.

OREGON SHORT LINE.—This road has completed the so-called "Loop" line, which circles the valley from Idaho Falls, Idaho, to St. Anthony. For the present the line will be used only for freight.

POND FORK RAILWAY.—Incorporated in West Virginia with $26,000 capital and headquarters at Huntington. The plans call for building a line from Madison, W. Va., up Pond Fork of Coal river to the headwaters of Pond Fork, about 25 miles. The incorporators include R. M. Baker, H. Fitzpatrick, J. William A. Read & Co., New York, are reported to have ington, W. Va.

SOUTHWESTERN POWER, LIGHT & RAILWAY.—Under this name a company was recently organized in Texas with a capital of $12,000,000, it is said, to build an interurban electric line between Denison, Tex., and Oklahoma City, Okla., about 150 miles. Power for the operation of the line will be provided by a group of hydro-electric plants which the company proposes to construct in southern Oklahoma. W. T. Croslen, president, Denison.

TENNESSEE RAILWAY.—Work is now under way building an extension of eight miles from Charley's Branch, Tenn., up New river, to a point about 45 miles south of Oneida, and about three miles air line from Petros. The extension to Petros will be considerably longer than three miles by the route the railroad will follow. J. E. Rodes, Nashville, Tenn., and the Harriman Construction Company, Harriman, Tenn., are the contractors. The work involves handling about 10,000 cu. yd. to the mile. The maximum grade on the main line will be 1.4 per cent, and the maximum curvature 14 deg. On branch lines to be built the maximum grade will be 3 per cent and the maximum curvature 16 deg. There will be several timber bridges on the line of from 10 to 40 ft. high and from 40 ft. to 600 ft. long.

RAILWAY STRUCTURES

Alberta, Canada.—The Edmonton, Dunvegan & British Columbia has awarded the contract for constructing a bridge over Smoky river to the Dominion Bridge Company, Ltd., Winnipeg, Man. The structure will consist of two 85-ft. deck plate girder approach spans, six 128-ft. deck truss spans, and one 125-ft. through truss span. Approximately 1,100 tons of steel will be required.

Amaraillo, Tex.—F. M. Bisbee, chief engineer, western lines of the Atchison, Topeka & Santa Fe, is receiving bids for the construction of an addition to the Santa Fe office building here. The improvements will approximate $35,000.

Baltimore, Md.—The Baltimore & Ohio has completed plans for a new coal pier to be built on Curtis Bay, Baltimore, but the work has not yet been authorized.

Charleston, S. C.—Contracts have been let by the Charleston Southern, it is said, for building trestles and foundations for drawbridges as follows: For one bridge over Stono river to the Charleston Engineering & Contracting Company, Charleston, S. C., and for another bridge over the same river to the Simons-Mayrant Company, Charleston; over the Edisto river to the Dawson Engineering Company, Charleston, and over Ashley river near Hampton Park to the Jefferson Construction Company, New Orleans, La. The railroad company plans to build a total of eight drawbridges in connection with the line to be built from Charleston southwest to Savannah, Ga.

Chicago, Ill.—The Chicago & Western Indiana has awarded the contract for placing concrete piling for abutments and piers at Eightieth street and Eighty-first street subways to the Raymond Concrete Pile Company of New York and Chicago.

Great Lakes Dredge & Dock Company has the contract for the substructure for the bridge which the Chicago & North Western plans to build over the North branch of the Chicago river. It will be a three-track, 180-ft., single-leaf bascule structure.

Coffeyville, Kan.—Clements & Lavery have been awarded a contract for the construction of the terminal building of the Union Traction Company in this city. It will be a two-story 96-ft. by 143-ft. brick and steel structure and will cost about $40,000.

The Dalles, Ore.—Nettleton, Bruce & Eschbach, of Seattle, Wash., have the contract for the construction of a roundhouse, machine shop and power plant for the Oregon-Washington Railroad & Navigation Company. Estimated cost $50,000.

Joplin, Mo.—The city has voted a bond issue of $13,000 to pay its share of the cost of a viaduct over the tracks of the Kansas City Southern. The municipality bears one-third of the cost, and the Kansas City Southern and the Missouri, Kansas & Texas the remainder. Plans have been prepared by the railroads.

Macon. Ga.—Plans have been filed with the Railroad Commission of Georgia for the new union passenger station to be built in Macon. It is expected that the plans will be approved and that bids will be asked for the work in the near future. The main structure will consist of a center building about 84 ft. wide and about 245 ft. long. In addition to the main building there will be a baggage and mail room about 72 ft. by 109 ft. and an express room about 72 ft. by 147 ft. The buildings will be of brick construction or other fireproof material.

Myakka City, Fla.—The East & West Coast has given a contract to T. R. Bryant, Wyakka City, it is said, for putting up a new station at that place.

Quincy Junction, Cal.—The Western Pacific has let a contract for 630 tons of steel for a viaduct here to the American Bridge Company.

Waterloo, Iowa.—The Illinois Central roundhouse here is being remodeled to accommodate larger motive power and equipment. T. S. Leake & Co. of Chicago have the contract.

West Tulsa, Okla.—Fairbanks, Morse & Co. have been awarded the contract for the new coaling station of the St. Louis & San Francisco to be built here. The plant will be a reinforced concrete structure of the "V" bucket type, with 300 tons capacity. The station will include a steam sand drier with a capacity of one cubic yard per hour.

Railway Financial News

Buffalo & Susquehanna Railway.—Morgan G. Bogue, representing the bondholders, has bought this railroad at a receivers' sale for $300,000. At the sale the electric railway interests recently reported as likely to buy the property were conspicuous by their absence.

Chicago, Rock Island & Pacific.—N. L. Amster, chairman of the committee representing minority stockholders, on September 14, arranged for the payment of $410,000 interest on bonds and issued the following statement:

"Our committee has succeeded in getting stockholders whom it represents to take $410,000 receivers' certificates. The court, among its friends in Chicago, has disposed of the remaining $90,000. The court will authorize the certificates and has been informed as to the institutions in New York and Chicago in which the money that has been pledged for the certificates has been or will be deposited.

"The company will have plenty of money out of earnings to pay the interest due October 1, and I believe that the same will be true with respect to the January 1 obligations. The court and the stockholders whom I represent were unwilling to see further inconveniences and loss to the stockholders as a result of the principal of the $20,000,000 debentures being declared due at this time because of default on the interest. We shall now have six months within which to work out a readjustment plan."

Judge George A. Carpenter, in the United States District Court at Chicago, on September 15, ordered the receivers to bring action in the Federal Court at New York against present and former directors of the company for the recovery of $6,000,000, alleged to have been wrongfully expended in the acquisition and subsequent divorcing of the Frisco lines. The defendants to be named are Daniel G. Reid, R. A. Jackson, W. H. Graham, Ogden Mills, E. S. Moore, William H. Moore, F. L. Hine, George G. McMurtry and G. T. Boggs. The action of Judge Carpenter is based on a report by William Howard Taft, who had been engaged as special counsel.

Cincinnati, Hamilton & Dayton.—See Cincinnati, Indianapolis & Western.

Cincinnati, Indianapolis & Western.—This company, a subsidiary of the Cincinnati, Hamilton & Dayton, owning that part of its system west of Hamilton, Ohio, aggregating 361 miles of line, has been sold at foreclosure to the joint reorganization committee representing the bondholders of the company at the upset price of $3,500,000, representing the two mortgages of $2,100,000 and $1,400,000, respectively, held against the road.

William A. Read & Co., New York, are reported to have obtained the support of a large proportion of the bondholders in a plan of reorganization which involves replacing the present bond issues with stock and raising new capital. The plan contemplates the operation of the road independently of the Cincinnati, Hamilton & Dayton.

B. A. Worthington is vice-president and general manager.

Maine Central.—At the annual meeting, October 20, stockholders will be asked to vote on retiring $10,000,000 of the road's outstanding stock and the issuance in place thereof of $3,000,000 of preferred stock, to receive 5 per cent. per annum in dividends and to have no voting power, and $7,000,000 25-year first mortgage bonds bearing interest at a rate of not exceeding 5 per cent.

Pacific & Idaho Northern.—E. M. Heigho, president, has been appointed receiver of this company on a voluntary petition for receivership.

The Railways of Brazil.—Although larger in area than the United States, Great Britain, Holland, Belgium, Portugal and Spain combined, Brazil ranks twelfth among the nations of the world in extent of railroad mileage. This may help to explain why Brazil has only 23,000,000 inhabitants. A considerable percentage of the Brazilian railroads is owned and operated by the government.—*The South American.*